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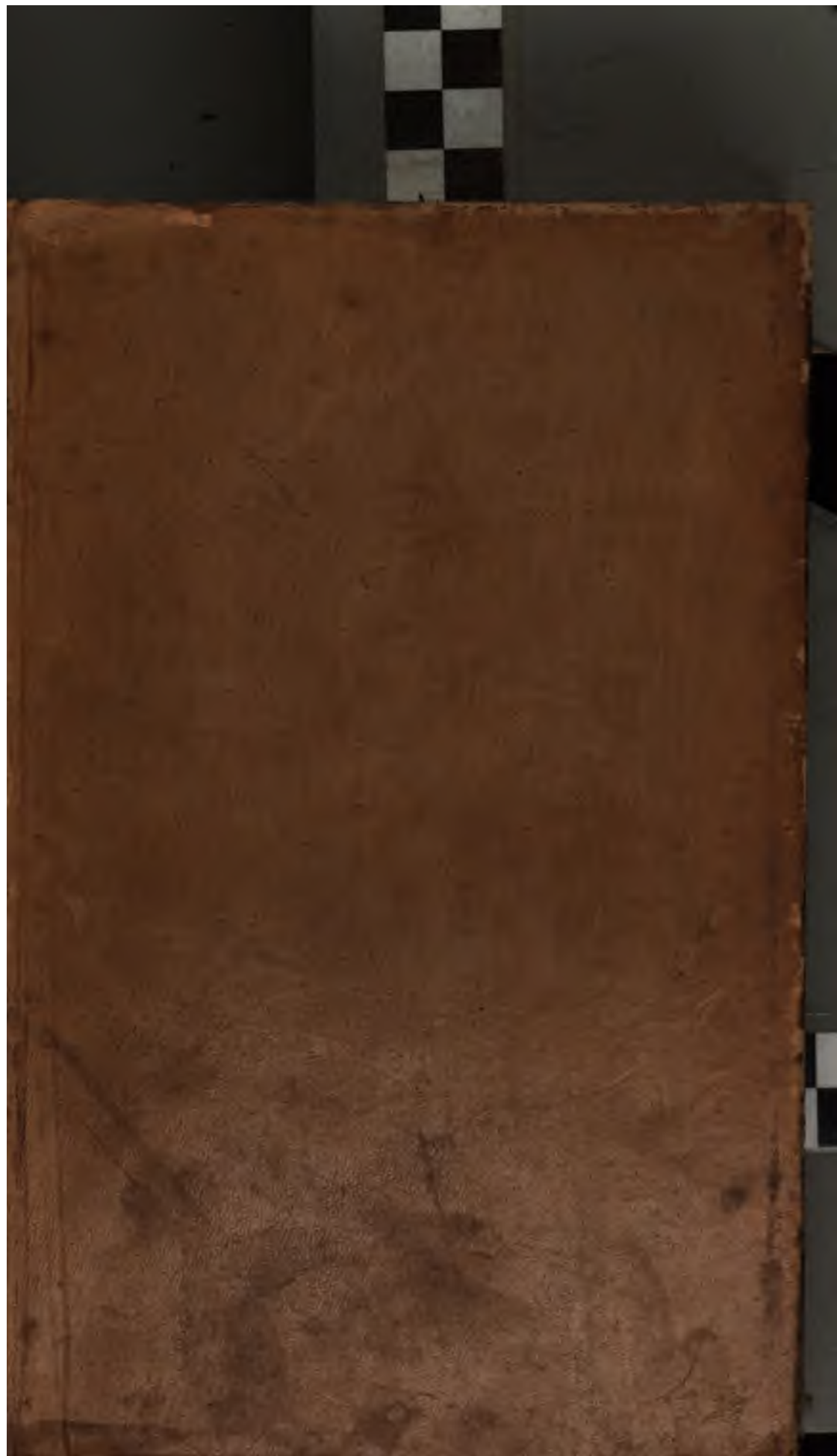
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AMERICAN
Natural History

BY

JOHN D. GODMAN M.D.



Philadelphia.

STODDART & AHERTON.

1828

**AMERICAN
NATURAL HISTORY.**

BY
JOHN D. GODMAN, M.D.

TO WHICH IS ADDED

HIS LAST WORK,
THE RAMBLES OF A NATURALIST,

WITH

A BIOGRAPHICAL SKETCH OF THE AUTHOR.

IN TWO VOLUMES.

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Chickaree S. 1 Grey S. 2 Black S. 3



AMERICAN NATURAL HISTORY.

CHAPTER I.

SPECIES I.—*The Fox Squirrel.*

Sciurus Vulpinus; GMEL.

Sciurus Vulpinus: GMEL. Turton's L. I. 91.
The Fox Squirrel: Lawson's Carolina, 194.

THIS fine squirrel is found throughout the southern states, where it frequents the pine forests in considerable numbers, and derives its principal subsistence from the seeds of the pine. In the tops of these lofty trees it is almost out of the reach of danger, except from the pine-marten or other climbing beasts of prey, and possibly some large predacious birds. The fox squirrel displays a consciousness of his security by the fearless manner in which he usually looks down upon those who pass under the tree on which he is placed. When alarmed, like many of his kindred species, he immediately resorts to the artifice of spreading himself out, or lying flat on the upper surface of a branch on the side opposite to the apprehended danger, where he patiently clings until he has no longer cause to fear. Under such circumstances it is very difficult to discover his position, or to distinguish him from the branch on which he lies.

The nest of this species is placed in the top of the high pine trees, and is made of twigs and small sticks, lined with leaves, or the long soft moss which is found so commonly streaming from the branches. The season of their sexual intercourse is the month of January. The young, which are from five to seven in number, are seen abroad as early as the month of March.

The fox squirrel measures about fourteen inches, and the tail is sixteen inches in length. The colour varies from white to pale gray and black; various shades of red, mottled, (like the cats called "tortoise shell,") and in short, of all the intermediate hues. This is fully shown in the Philadelphia Museum,

where nearly all the varieties just mentioned may be seen. It is therefore not surprising that those who deem colour a sufficient indication of specific difference, should make a number of species of this one. Perhaps many, at present considered well established, will be found to rest on no better foundation, and require to be stricken out of the catalogue.*

SPECIES II.—*The Cat Squirrel.*

Sciurus Cinereus; L. GMEL.

Cat Squirrel, B. PENN. Arct. Zool. i. 137.

Sciurus Capistratus: Bosc. An. du Mus. i. p. 205.

Ecureuil à Masque: C. Règne Anim. i. 205.

Ecureuil Capistratus: DESM. Mammal. p. 332, Sp. 529.

The cat squirrel is one of our largest species, and is found in great abundance throughout the oak and chesnut forests of this country. It is generally about eleven inches long, having a tail fourteen inches in length.

This squirrel is comparatively heavy and slow in its movements, running up the trunks of trees and among the branches with more apparent effort than any of the other species; its appearance also is by no means as pleasing as that of any of its kindred. It is rarely seen to leap from tree to tree, or even from branch to branch, except when closely pursued or much alarmed. In building its nest, and in general habits, it is very similar to the other species. The size is the only circumstance which distinguishes it positively from the fox squirrel.

As to colour, it is impossible to state all the shades and variegations exhibited by this species. In the Philadelphia Museum a great variety may be seen, of almost every colour, from a light gray to black and spotted, pale reddish brown and nearly white. Three individuals, taken from the same nest, are so differently coloured as to be entirely unlike, one having all the marks attributed to the *capistratus*, and the others strongly resembling the common black squirrel.

* We have much pleasure in acknowledging the receipt of a letter on the subject of the squirrels of this country, from Capt. J. Le Conte, U. S. A. The time, we hope, will soon arrive when this accomplished naturalist will find leisure to give the scientific world the full benefit of his valuable researches relative to American Natural History.

SPECIES III.—*The Common Gray Squirrel.**Sciurus Carolinensis*; GMEL.*Sciurus Carolinensis* et *Cinereus*: GM. SCHREB. tab. 213.*Petit Gris*: BUFF. 10. pl. 25, Encycl. pl. 74, fig. 3.*Ecureuil gris de la Carolina*: BOSS. ii. p. 96, pl. 29; F. CUV. Mam. Lithog. livr. 11c.*Gray Squirrel*: PENN. Arct. Zool. i. 135, Hist. Quad. No. 272.

This species, still exceedingly common throughout the United States, was once so excessively multiplied as to be a scourge to the inhabitants, not only consuming their grain, but exhausting the public treasury by the amount of premiums given for their destruction. "Pennsylvania (says Pennant,) paid from January 1749 to January 1750, *eight thousand pounds* currency; but on complaint being made by the deputies that their treasuries were exhausted by these rewards, they were reduced to one half;—[from three pence to a penny and a half.] How improved must the state of the Americans then be, in thirty-five years to wage an expensive and successful war against its parent country, which before could not bear the charges of clearing the provinces from the ravages of these insignificant animals!"

The gray squirrel prefers the oak, hickory and chesnut woods, where it finds a copious supply of nuts and mast, of which it provides large hoards for the winter. Their nests are placed chiefly in tall oak-trees at the forks of the branches; these nests are very comfortable, being thickly covered and lined with dried leaves. During cold weather the squirrels seldom leave these snug retreats, except for the purpose of visiting their store-houses, and obtaining a supply of provisions. It has been observed that the approach of uncommonly cold weather is foretold when these squirrels are seen out in unusual numbers, gathering a larger stock of provisions, lest their magazines should fail. This, however, is not an infallible sign, at least in vacinities where many hogs are allowed to roam at large, as these keen-nosed brutes are very expert at discovering the winter hoards of the squirrel, which they immediately appropriate to their own use.

If the gray squirrels confined themselves to the diet afforded by the forest trees, the farmers would profit considerably thereby. But, having once tasted the sweetness of Indian corn and other cultivated grains, they leave acorns and such coarse fare to the hogs, while they invade the corn-fields, and carry off and destroy a very large quantity.

This species is remarkable among all our squirrels for its beauty and activity. It is in captivity remarkably playful and

mischievous, and is more frequently kept as a pet than any other. It becomes very tame, and may be allowed to spend a great deal of the time entirely at liberty, where there is nothing exposed that can be injured by its teeth, which it is sure to try upon every article of furniture, &c. in its vicinity. This squirrel, when domesticated, drinks frequently, and a considerable quantity of water at each draught.

The gray squirrel varies considerably in colour, but is most commonly of a fine bluish gray, mingled with a slight golden hue. This golden colour is especially obvious on the head, along the sides, where the white hair of the belly approaches the gray of the sides, and on the anterior part of the fore and superior part of the hind feet, where it is very rich and deep. This mark on the hind feet is very permanent, and evident even in those varieties which differ most from the common colour. There is one specimen in the Philadelphia Museum of a light brownish red on all the superior parts of the body.

SPECIES IV.—*The Black Squirrel.*

Sciurus Niger; L.

Black Squirrel: PENN. Arct. Zool. i. 138. Hist. Quad. No. 273. BROWN'S Zool. tab. xvii.

Sciurus Mexicanus: HERNAN. 582.

Black Squirrel: Catesby's Carolina, ii. p. 73.

This species is very common, but is liable to be confounded with the black varieties of the squirrels heretofore described. From the black varieties of the cat squirrel, *S. Cinereus*, it may be easily distinguished by its smaller size and the softness of its fur. The proportional length of the tail, together with the difference in number of the jaw teeth, will distinguish it from the fox squirrel, *S. Vulpinus*, which has five above and four below, while the black squirrel has four above and four below.

The black squirrel very seldom varies; in the summer the pelage is rather gray on the back and sides, though the whole colour of the body is a black, intermingled with a small quantity of gray, and of a dark reddish brown on the under parts. In the winter the colour is a pure black, varying slightly in intensity on any part of the body.

SPECIES V.—*The Great Tailed Squirrel.**Sciurus Macrourus*; SAY.*Sciurus Macrourus* :^{*} SAY. Long's Exp. to the Rocky Mountains, I. 115.

This species, which is a fine one, is the most common on the Missouri, where it was first observed by SAY, who describes it as displaying all the graceful activity so much admired in the common gray squirrel.

The total length of this species from the tip of the nose to the end of the tail (exclusive of the hair) is nineteen inches and three-quarters, of which the tail makes nine inches and one-tenth. The following description of its colouring, &c. is drawn up from that given by SAY, in the work above quoted :

The body above and on each side is of a mixed gray and black ; the fur is plumbeous, black at base, then pale cinnamon colour, then black, and finally cinereous, with a long black tip. The ears, three-fourths of an inch long, are behind of a bright ferruginous colour, extending to the base of the fur, which, in the winter dress, is prominent beyond the edge ; on the inside of the ear the fur is of a dull ferruginous hue, slightly tipped with black. The sides of the head and orbits of the eyes are pale ferruginous ; beneath the ears and eyes the cheeks are dusky. The whiskers are composed of about five series of rather flattened hairs, the inferior ones are more distinct. The mouth is margined with black ; the teeth are of a reddish yellow colour. The under part of the head and neck, and the upper part of the feet, are ferruginous ; the belly is paler, the fur being plumbeous at base. The tail is of a bright ferruginous colour below, and this colour extends to the base of the fur with a submarginal black line. On its upper part it is ferruginous and black. The fur within is of a pale cinnamon colour, with the base and three bands black ; the tips ferruginous. The palms of the fore feet are black, and the rudimental thumb, which is very short, is covered by a broad flat nail.

"The fur of the back in the summer dress is from three-fifths to seven-tenths of an inch long ; but in the winter dress the longest hairs of the middle of the back are from one inch

* As the term *Macrourus* was previously given to the Ceylon squirrel, (see Pennant's History of Quadrupeds, ii. p. 140, No. 330,) we have taken the liberty to change the name given to the present species, by the addition of a single letter, which is sufficient to render further change unnecessary.

to one and three-fourths in length. This difference in the length of the hairs, combined with a greater portion of fat, gives to the animal a thicker and shorter appearance; but the colours continue the same, and it is only in this latter season that the ears are fringed, which is the necessary consequence of the elongation of the hair. The species was not an unfrequent article of food at our frugal yet social meals, at Engineer cantonment, and we could always immediately distinguish the bones from those of other animals by their remarkably red colour. The tail is even more voluminous than that of the *S. Cinereus*;" (cat squirrel.)

SPECIES VI.—The Line Tail Squirrel.

Sciurus Grammurus; SAT.

This species is most remarkable for the peculiar coarseness and flattened form of its fur, and by three black lines on each side of the tail, which are united over the surface of it, as in the Barbary squirrel, *S. Getulus*.

The line tail squirrel inhabits the Missouri country, about the naked parts of the sand-stone cliffs, where there are but few bushes. Its nest is found in holes and crevices of rocks, and it appears not to be in the habit of ascending trees, unless driven. It feeds on the buds, leaves, and fruits of the plants growing in the situations we have mentioned.

The line tail squirrel measures eleven inches and a half, and its tail is nine inches long. The general colour of the body is cinereous, variously tinged with rust colour. The fur is very coarse, much flattened, canaliculate above; it is lead coloured or blackish at base, then whitish or ferruginous, with a brownish tip. The whitish colour prevails above the neck and shoulders, while the ferruginous is in greatest quantity from the middle of the back, sides, and exterior surface of the legs; above and below the orbits of the eyes the fur is whitish, the tail is whitish, being marked by three black lines, the base and tip of each hair being whitish, beneath, the colour is whitish tinged with ferruginous.

SPECIES VII.—*The Four Lined Squirrel.**Sciurus Quadrivittatus*; SAY.*Sciurus Quadrivittatus*: SAY. Long's Exp. to the Rocky Mountains, ii. 45.

This handsome little squirrel is found on the Rocky Mountains adjacent to the sources of the rivers Arkansa and Platte. Of its habits we know nothing but what is given in the following sentences, by SAY, in the work above quoted :

"It does not seem to ascend trees by choice, but nestles in holes and on the edge of the rocks. We did not observe it to have cheek-pouches. Its nest is composed of a most extraordinary quantity of the burrs of the xanthium, branches and other portions of the large upright cactus, small branches of pine trees, and other vegetable productions, sufficient in some instances to fill an ordinary cart. What the object of so great, and apparently so superfluous, an assemblage of rubbish may be, we are at a loss to conjecture, we do not know what peculiarly dangerous enemy it may be intended to exclude by so much labour. Their principal food, at least at this season, is the seeds of the pine, which they readily extract from the cones."

The four lined squirrel is four inches and a quarter long, from the tip of the nose to the root of the tail; the tail is three inches in length. The head is of a brown colour, mixed with tawny, having four white lines; the upper one on each side passes from the tip of the nose immediately over the eye to the superior base of the ear, and the lower one passes immediately beneath the eye to the inferior base of the ear. The ears are of a moderate size and half oval. On the back there are four broad white lines, and alternate, mixed black and ferruginous ones. The sides are tawny; the under part of the body whitish. The hair of the tail is black at base, then tawny, then black in the middle, and paler tawny at tip. Beneath it is fulvous, having a submarginal black line. On the anterior feet there is a prominent tubercle in place of a thumb. The striped head, less rounded ears, and bushy tail, which is neither banded nor striated, together with its smaller size and the presence of the thumb warts, in Say's opinion, sufficiently distinguish this species from the *S. Getulus*, or Barbary squirrel of Linné.

SPECIES VIII.—*The Hudson's Bay Squirrel.**Sciurus Hudsonius*: FOSTER. Royal Soc. Trans. lxii. 378.*Hudson Squirrel*: PENN. Arct. Zool. i. 134. No. 48. Hist. Quad. No. 274.*Sciurus Hudsonius*: GMEL. SCHREB. tab. 214.*The Common Squirrel*: HEARNE, 8vo. ed. 378.[Commonly called *Chickaree*.]

This beautiful species is very common in the northern and western parts of this country, and, where seldom disturbed, are so fearless as to allow themselves to be approached almost within reach. They resemble the European more closely than any of our squirrels, and are remarkable for having tufts on the ears like that species, *S. Vulgaris*.—This arrangement of the hair on the ears has been hitherto regarded as peculiar to European squirrels, and Pennant, in his Arctic Zoology, has prefixed to his description of the Hudson's Bay squirrel the following: "N. B. The ears of the *American* squirrels have no tufts," which is rather unfortunately placed before an *American species*, possessing these appendages in a very conspicuous degree.*

The Hudson's Bay squirrel is, perhaps, more remarkable for its neatness and beauty than any of its kindred species, which, in habits and manners, it closely resembles. It is between seven and eight inches long, having a tail five inches in length. Its whiskers are very long and black; the superior parts of the body are of a reddish brown colour, varying in intensity, and shaded with black. On the inferior parts the general colour is a tarnished or yellowish white.—The under part of the head and front of the fore limbs are reddish brown, like the back; the insides of the thighs are coloured like the belly; on each flank there is a distinctly marked black line, separating the colours of the back and belly. The tail is of a reddish brown colour, and is very beautiful.

"The common squirrels are plentiful in the woody parts of this (the Hudson's Bay) country, and are caught by the natives in considerable numbers with snares, while the boys kill many of them with blunt-headed arrows. The method of snaring them is rather curious, though very simple, as it consists of nothing more than setting a number of snares all around the body of the tree in which they are seen, and ar-

* Other American species of squirrels have tufts on their ears, when in full pelage; none, however, so remarkably as the Hudson's Bay squirrel. Next to this species, SAY's great tailed squirrel (*S. Macrourus*.) has them longest.

ranging them in such a manner that it is scarcely possible for the squirrels to descend without being entangled in one of them. This is generally the amusement of the boys. Though small, and seldom fat, yet they are good eating.

"The beauty and delicacy of this animal induced me to attempt taming and domesticating some of them, but without success; for though several of them were so familiar as to take any thing out of my hand, and sit on the table where I was writing, and play with the pens, &c. yet they never would bear to be handled, and were very mischievous, gnawing the chair bottoms, window-curtains and sashes to pieces. They are an article of trade in the company's standard, but the greatest part of their skins, being killed in summer, are of very little value."^{*}

SPECIES IX.—*The Red Belly Squirrel.*

Sciurus Rufiventer; GEOFF.

Sciurus Rufiventer: GEOFF. Coll du Mus. DESM. Nouv. Dict. d'Hist. Nat. tom. x. 103.

An individual of this species, brought from the vicinity of New-Orleans, belongs to the valuable collection of the Philadelphia Museum. It is about seven or eight inches long, having the tail shorter than the body. Its general colour is dark grayish brown above, with a bright yellowish red beneath. The tail at its base is of the colour of the back, about its middle it is of nearly the same colour as the belly, and at the extremity it is yellowish.†

* Hearne, as above cited.

The following is the description of this species, given by Desmarest. p. 333:—The pelage is of a reddish brown, pricked with black on the head, neck, flanks and paws; all the hairs covering these parts being of a gray slate-colour at their bases, then clear brown or yellowish, and deep brown at their tips; the lower jaw, under part of the neck, throat, belly, and inner surface of the paws, of a nearly pure red. The neck is as if marked with transverse brownish lines; whiskers black and as long as the head; ears reddish and covered with short hairs; extremities of the paws of a deep brown, without mixture of yellow; tail bushy, brown at its base and yellow at its extremity.

SPECIES X.—*The Ground Squirrel*.**Sciurus Striatus*; KLEIN.*Sciurus Striatus*: KLEIN, PALL. Glires, 378. GMEL. SCHN. tab. 221.*Sciurus Lysteri*: RAY, LYN. Quad. 216.*Sciurus Carolinensis*: BRISS. Reg. An. 155, No. 9.*Ecouvill Suisse*: DESM. 339, Sp. 547.

[Commonly called Hacky or Hackee, Ground, or Striped Squirrel.]

Few persons have travelled through our delightful country without becoming acquainted with the pretty animal we are now to describe, which, though very different in its general appearance from its kindred tenanted the lofty forest-trees, still approaches to them so closely in personal beauty and activity, as always to command the attention of the most incidental observer.

This squirrel is most generally seen scudding along the lower rails of the common zigzag or "Virginia" fences, which afford him at once a pleasant and secure path, as in a few turns he finds a safe hiding place behind the projecting angles, or enters his burrow undiscovered. When no fence is near, or his retreat is cut off, after having been out in search of food, he becomes exceedingly alarmed, and runs up the nearest tree, uttering a very shrill cry or whistle, indicative of his distress, and it is in this situation that he is most frequently made captive by his persecuting enemies, the mischievous school-boys.

The ground squirrel makes his burrow generally near the roots of trees, along the course of fences and old walls, or in banks adjacent to forests, whence he obtains his principal supplies of food. The burrows frequently extend to very considerable distances, having several galleries or lateral excavations, in which provisions are stored for winter use. The burrow has always two openings, which are usually far distant from each other; it very rarely happens that the animal is dug out, unless it be accidentally during the winter season.

The ground squirrel appears to suffer more when made captive than any other squirrel with which we are acquainted. We have several times endeavoured to tame individuals of this species, but without success. In losing its liberty, the ground squirrel appears to lose all vivacity, becomes a dull and melancholy animal, and can yield very little amusement

* This and the following species belong to the subgenus *Tamias* of Illiger; having cheek-pouches.





1. Flying Squirrel. 2. Great-tailed S. 3. Ground S.—

or satisfaction to its keeper, whom it always flies, or bites severely, if not permitted to get out of his reach.

The ground squirrel is rather more than five inches in length, from the nose to the root of the tail; the last is about two inches and a half long.—The general colour of the head and upper parts of the body is reddish brown, all the hairs on these parts being gray at base. The eyelids are whitish, and from the external angle of each eye a black line runs towards the ear, while on each cheek there is a reddish brown line. The short rounded ears are covered with fine hairs, which are on the outside of a reddish brown colour, and within of a whitish gray. The upper part of the neck, shoulders, and base of the hair on the back, are of a gray brown, mingled with whitish.

On the back there are five longitudinal black bands, which are at their posterior parts bordered slightly with red. The middle one begins at the back of the head, the two lateral ones on the shoulders; they all terminate at the rump, whose colour is reddish. On each side two white separate the lateral black bands. The lower part of the flanks and sides of the neck are of a paler red; the exterior of the fore feet is of a grayish yellow; the thighs and hind feet are red above. The upper lip, the chin, throat, belly, and internal face of the limbs, are of a dirty brown. The tail is reddish at its base, blackish below, and has an edging of black.

SPECIES XI.—The Rocky Mountain Ground Squirrel.

Sciurus Lateralis; SAY.

Sciurus Lateralis: SAY. Long's Exped. to the Rocky Mountains, ii. 46.

The Rocky Mountain ground squirrel was first seen by LEWIS and CLARKE, while on their celebrated expedition to the Pacific Ocean; they, however, merely mention it in their journal, without appending a particular description. SAY has given a description of the species, but no account of its habits, which we may infer to be generally similar to those of the common ground squirrel, to which this species is nearly allied.

The Rocky Mountain ground squirrel may be distinguished from the common species by being of rather larger size, entirely destitute of the line along the middle of the back; by the lateral lines commencing anterior to the humerus, where they are broadest; by the longer nails on the fore feet, and the broad nails on the thumb tubercles. It is, however, most closely allied to the *S. Bilineatus* of Geoffroy.

The body is of a brownish ash colour, intermixed with blackish above. On each side of the back there is a dull yellowish white dilated line, which is broader before, and margined above and beneath with black; these lines commence on the neck, anterior to the fore limbs, and terminate before they reach the tail. There is no vertebral line. The top of the head, neck, anterior to the tip of the white line, and the thigh, are tinged with rust-colour; the orbit is whitish. The sides are of a dull yellowish-white; the colour beneath is pale mixed with blackish. The tail is short and thin, having a submarginal black line beneath. The nails on the fore feet are elongated, and the thumb tubercles are furnished with broad nails.*

* SAY; loco citato.

CHAPTER II.

GENUS. XXIX.—FLYING SQUIRREL; *Pteromys*; ILL.

GENERIC CHARACTERS.

THE head is short and thick, having small or moderate sized ears, large prominent eyes, a somewhat blunted snout, and the upper lip divided. The trunk of the body is proportionally shorter and thicker than in other squirrels, and the skin of the sides is extended from the fore to the hind limbs, so as to form a sort of sail, which in most of the species, is spread out by an additional bone on the anterior extremities, articulated with the wrist. The tail is either long, or of moderate length, flattened and distichous.

The dental system of this genus is the same as the preceding.

SPECIES 1.—*The Common Flying Squirrel.*

Pteromys Volucella.

Sciurus Volucella: L. GWEL. PALL. SCHREB. pl. 222.
Pteromys Volucella: DESM. MAM. 343, ENCYCL. pl. 77. fig. 4.
Le Polatouche: BUFF. x. pl. 21. SHAW, GEN. ZOOL. ii. pt. 1, p. 155.
Assepannick: SMITH'S VIRGINIA, p. 27.
Asapan: FREED. CUV. MAMMAL. LITHOG. livr. 8.

Nature has endowed this beautiful animal with an instrument to facilitate its passage from place to place in the easiest and most pleasant manner. Capable of moving on the bodies and limbs of trees, like other squirrels, it does not require an equal degree of muscular strength to leap from tree to tree, or from great elevations to the ground, but launching itself from a lofty bough into the air, and extending its limbs and the intervening membranes, its body is buoyed up as by a parachute, and sails swiftly and obliquely downwards, passing over a very considerable space. To aid in this sailing movement, we find the whole body covered with a short and silky fur, which lies close to the skin, and the hairs on the tail, which partake of the same quality, lie close, and form a flattened and feather-shaped rudder.

During the day-light the flying squirrel is rarely to be met with abroad, unless it has been disturbed. Occasionally large troops are seen together, and their sailing leaps have been said to present to the inexperienced the appearance of a large number of leaves blown off the trees. Their peculiar construction and habit render them very unfit for living on the ground, and they speedily regain the nearest tree, when at any time they fall short of the object towards which they may have leaped. They always take advantage of the wind, when about to leap to any distance, and then they appear to deserve the name of flying-squirrels, from the ease and velocity of their movements.

This species is very common throughout the United States, and individuals are frequently tamed as pets, but are more admired on account of the softness of their fur, and the gentleness of their dispositions, than for any of the frolicsome and amusing actions that characterize other squirrels. Their nocturnal habits, more than their fondness for warmth, or the persons of their keepers, make them always desirous to hide themselves in the pockets, &c. When confined in a cage with a reel appended, they continue running almost uninterruptedly throughout the night.

The flying-squirrel makes its nest in hollow trees, where it brings forth three or four young at a litter. It is very easy to ascertain whether this squirrel has a nest in any hollow tree, by knocking against the trunk with a stone or stick; as soon as the jarring is felt, the animal comes to the opening and endeavours to escape. In this way the young are very commonly discovered and taken.

The flying-squirrel is quite small, being little more than four inches and a half long, the tail being three inches and a half in length.

The general colour is a brownish ash, with rounded, nearly naked ears, and large prominent black eyes. The under parts of the body are white, with a yellowish margin where the colour of the back and belly approach each other.

CHAPTER III.

SECTION II.—INCLAVICULA.

The Clavicles incomplete, or entirely wanting.

GENUS XXX.—PORCUPINE; *Hystrix*; L.

Germ. Stachelthier; Stachelschwein.
Fr. Porc-épic Port. Ouriço-cacheiro.

GENERIC CHARACTERS.

THE head is rather short, with an obtuse and somewhat compressed snout, long whiskers, short rounded ears, and small eyes; the upper lip is cleft, and the tongue set with scaly spines. The covering of the body is partly of bristles and partly of prickles or spines. The neck is thick, the belly large, and the limbs of equal length; the anterior have four, and the posterior five digits, armed with long, stout, curved nails. The tail is either short or of moderate length, and not prehensile.

Dental System.

20Teeth:	{	10 Upper	{ 2 Incisive
			{ 8 Molar.
	{	10 Lower	{ 2 Incisive
			{ 8 Molar.

IN THE UPPER JAW the incisors are rounded and even in front, and they arise from the anterior and inferior part of the maxillary bone. The molars are of nearly the same size from the first to the last, and they are especially remarkable for the elevation of the crown above the neck of the root. The outline they present is very irregular. In the young animal they are traversed with various degrees of irregularity, by grooves, which, after being worn to a certain extent, begin to be interrupted, and then they exhibit a depression in front on the inside, and another at the back part on the outside; in front, as at the back part, one or two ellipses are seen, the remains of primitive grooves or tubercles. In old animals we find teeth with only one depression, and in the middle, three or four insulated figures, more or less irregular.

IN THE LOWER JAW the incisors resemble those in the upper, and take root some lines below the condyles. The molars have a great general resemblance to those of the upper jaw, and a precise idea can only be obtained by actual inspection, as description cannot convey a knowledge of such irregular and variable forms as are presented at different stages in the course of attrition.

SPECIES I.—*The Canada Porcupine.*

Hystrix Dorsata ; L. GMEL.

Hystrix Dorsata : ERXL. SCHREB. pl. 169, SAB. App. 664.
Hystrix Hudsonis : BRISS. 128.
Cavia Hudsonis : KLEIN. Quad. 51.
Hystrix Pilosus Americanus : CATESBY, Car. App. 30.
Urson : BUFF. xii. pl. 52.

The American porcupine exhibits none of the long and large quills which are so conspicuous and formidable in the European species, and the short spines or prickles which are thickly set over all the superior parts of its body are covered by a long coarse hair, which almost entirely conceals them. These spines are not more than two inches and a half in length, yet form a very efficient protection to our animal against every other enemy but man. Too slow in its movements to escape by flight, on the approach of danger the porcupine places his head between his legs, and folds his body into a globular mass, erecting his pointed and barbed spines. The cunning caution of the fox, the furious violence of the wolf, and the persevering attacks of the domestic dog, are alike fruitless. At every attempt to bite the porcupine, the nose and mouth of the aggressor is severely wounded, and the pain increased by every renewed effort, as the quills of the porcupine are left sticking in the wounds, and the death of the assailant is frequently the consequence of the violent irritation and inflammation thus produced.

In the remote and unsettled parts of Pennsylvania the porcupine is still occasionally found, but south of this state it is almost unknown. According to Catesby it never was found in that direction beyond Virginia, where it was quite rare. In the Hudson's Bay country, Canada, and New England, as well as in some parts of the western states, throughout the country lying between the Rocky Mountains and the great western rivers, they are found in great abundance, and are highly prized by the aborigines, both for the sake of their flesh and their

quills, which are extensively employed as ornaments to their dresses, pipes, weapons, &c.

The porcupine passes a great part of its time in sleep, and appears to be a solitary and sluggish animal, very seldom leaving its haunts, except in search of food, and then going but to a short distance. The bark and buds of trees, such as the willow, pine, ash, &c. constitute its food during the winter season; in summer, various wild fruits are also eaten by this animal.

Dr. BEST, of Lexington, Ky. in a letter to the author of this work observes, that "the porcupine is seldom found in the state of Ohio, south of Dayton; but they are numerous on the river St. Mary. During winter they take up their residence in hollow trees, whence it appeared to me in several instances, from their tracks in the snow, they only travel to the nearest ash-tree, whose branches serve them for food. In every instance which came under my observation, there was no single track, but a plain beaten path, from the tree in which they lodged to the ash from which they obtained their food. I cut down two trees for porcupine, and found but one in each; one of the trees also contained four raccoons, but in a separate hollow, they occupied the trunk, the porcupine the limbs.

The following are HEARNE's observations on this species:—"Porcupines are so scarce to the north of Churchill river, that I do not recollect to have seen more than six during almost three years residence among the northern Indians. Mr. Pen-nant observes, in his Arctic Zoology, that they always have two at a time, one brought forth alive, and the other still-born, but I never saw an instance of this kind, though in different parts of the country I have seen them killed in all stages of pregnancy. The flesh of the porcupine is very delicious, and so much esteemed by the Indians, that they think it the greatest luxury their country affords. The quills are in great request among the women, who make them into a variety of ornaments, such as short-bags, belts, garters, bracelets, &c.* They are the most forlorn animals I know; for in those parts of Hudson's Bay where they are most numerous, it is not common to see more than one in a place. They are so remarkably slow and stupid, that our Indians, going with packets from fort to fort, often see them in the trees, but not having occasion for them at that time, leave them till their return, and should their ab-

* *Modus illis copulandi (testante HEARNE,) profecto singularis est. Femina super marem dorso recubantem, a capite usque ad caudam ambulat, donec genitalia mutuo tangunt, sic, spinis acutis evitatis, veneris suaviis, fruuntur: aliquando ambobus lateribus resupinatis, actum est.*

sence be for a week or ten days, they are sure to find them within a mile of the place where they had seen them before."

The patience and ingenuity displayed by the Indian women in ornamenting dresses, buffalo robes, mocassins, &c. can scarcely be appreciated by those who have never seen any of the articles thus adorned. We have already mentioned that these quills rarely exceed two inches and a half, or at most three inches in length, and are not larger in circumference than a moderate sized wheat straw. Yet we find large surfaces worked or embroidered in the neatest and most beautiful manner with these quills, which are dyed of various rich and permanent colours. In making this embroidery they have not the advantage of a needle, but use a strait awl. Some of their work is done by passing the sinew of a deer or other animal through a hole made with the awl, and at every stitch wrapping this thread with one or more turns of a porcupine-quill. When they wind the quill near to its end, the extremity is turned into the skin, or is concealed by the succeeding turn, so as to appear, when the whole is completed, as if but a single strip had been used. In other instances the ornament is wrought of the porcupine-quills exclusively, and is frequently extremely beautiful, from its neatness and the good taste of the figures into which it is arranged. In general, however, the strong contrast of colours is the most remarkable effect aimed at. On some of the articles of dress figures of animals, exhibiting much ingenuity, are formed by embroidering with these quills. The Philadelphia Museum, so rich in objects of natural history, also boasts a most splendid and valuable collection of articles of dress, and implements of peace and war, peculiar to the various aborigines of our country. Whoever wishes to see to what extent the quills of the porcupine are employed by these interesting people, and also to form a better idea of the number of porcupines that must be found in the trans-Mississippian regions, may be fully gratified by visiting this great institution.

CHAPTER IV.

GENUS XXXI.—HARE ; *Lepus* ; L.

Fr. Lièvre.

Germ. Hase.

GENERIC CHARACTERS.

THE head is narrow and compressed, having a rather acute snout, large, prominent, laterally-placed eyes, and long ears, situated close together. The upper lip is cleft, and the inside of the cheeks covered with hair: in each groin there is a fold of the skin that forms a sort of pouch. The fore limbs are slender and short, and have five digits, which are below covered with a soft, velvety hair; the posterior limbs are very long, and have four digits, the soles being covered with hair similar to that in the palms. The teats are from six to ten in number; the tail is very short, and turned upwards.

Dental System.

28 Teeth:	{ 16 Upper	{ 4 Incisive
		{ 12 Molar.
	{ 12 Lower	{ 2 Incisive
		{ 10 Molar.

It is known how anomalous the hares are in the order of *gnawers*, by the number and singular arrangement of their upper incisor teeth. They are equally so in the structure of the head, and in many other organic peculiarities, which do not allow them to be naturally approximated to any other group of this order.*

IN THE UPPER JAW the anterior incisor is flat on its anterior surface, and unequally divided by a longitudinal depression, nearer to its internal than its external edge. Behind this tooth another small one is found, divided at its extremity by a transverse groove, and in very young individuals we find a third tooth behind the second, but it soon falls out, and the alveole disappears; these two last teeth are placed in the intermaxillary bones. The molars have nearly the same struc-

* These animals have an exceedingly large cæcum, which has a spiral valve running through its whole length. Beneath the orbit of the eye, there is, in the skull, a space at the inner angle, which is cribriform, or pierced by a great number of small holes.

ture, but differ in size. They are twice as long as their breadth; the first, smaller than the succeeding one, exhibits two folds of enamel on its anterior surface, but all the parts of these rejoin, and are solidified together. The four following are of the same size, and divided longitudinally in their middle by two folds of enamel, which arise at their extremities and approach each other, so that the laminae composing them, though entirely reunited, leave no intervening vacancy proper to be filled by the cortical matter. The internal fold is the most profound. The last molar, which is extremely small, appears to have no fold, and to be of a simple structure,—that is, it presents the form of a very elongated ellipsis, surrounded by enamel.

IN THE LOWER JAW the incisor is smooth and flat. The molars are formed after the same system as those of the upper jaw, but differ slightly from each other. The first, which is the largest, has three sides on its external face, and a slight depression on its anterior face, although it is only divided into two parts by a deep fold of enamel, the plates of which reunite. The three following are similar: they are of the same size, and divided by a deep fold of enamel, the plates joining each other only on the outside, which leaves a deep depression on their inner face. The fifth is a third smaller than the preceding, and divided into two unequal parts by two lateral grooves, the anterior of which is the largest.

SPECIES I.—*The American Hare.*

Lepus Americanus; L. GMEL.

Lepus Americanus: SCHÆFF. Natur. fig. 20, p. 20.

Lepus Hudsonius: PALL. Glir. pt. 1, p. 30.

American Hare: PENN. Arct. Zool. i. 109, No. 38, Hist. Quad. No. 243; HEARNE, Journey, &c. 8vo. ed. 385; SABINE, App. to Franklin's Exped. 665.

[Commonly, but improperly, called Rabbit.]

The American Hare is found throughout this country to as far north as the vicinity of Carlton House, in the Hudson's Bay country. According to the statement of HEARNE "they are not plentiful in the eastern parts of the northern Indian country, not even in those parts that are situated among the woods; but to the westward, bordering on the southern Indian country, they are in some places pretty numerous, though by no means equal to what has been reported of them at York Fort, and some other settlements in the Bay." In various parts of the Union this hare is exceedingly common, and large

numbers are annually destroyed for the sake of their flesh and fur.

The timidity and defencelessness characteristic of the genus, are well illustrated in this species, which has no protection against its numerous enemies, and can escape by flight alone. Its peculiar colour must, however, minister to its safety, as it is so similar to the general colour of the soil as to require a close attention to distinguish the animal, which is usually passed without being observed by such as are not especially in search of it. Yet the swiftness and other natural advantages of the hare, insufficient to secure it from the artifices of man, or from being preyed upon by various beasts and birds, would not prevent the species from soon being extinguished, were it not for its remarkable fecundity.

During the day time the hare remains crouched within its form, which is a mere space of the size of the animal, upon the surface of the ground, cleared of grass, and sheltered by some overarching plant; or else its habitation is in the hollowed trunk of a tree, or under a collection of stones, &c.

It is commonly at the earliest dawn, while the dew-drops still glitter on the herbage, or when the fresh verdure is concealed beneath a mantle of glistening frost, that the timorous hare ventures forth in quest of food, or courses undisturbed over the plains. Occasionally during the day, in retired and little frequented parts of the country, an individual is seen to scud from the path, where it has been basking in the sun; but the best time for studying the habits of the animal is during moon-light nights, when the hare is to be seen sporting with its companions in unrestrained gambols, frisking with delighted eagerness around its mate, or busily engaged in cropping its food. On such occasions the turnip and cabbage fields suffer severely, where these animals are numerous, though in general they are not productive of serious injury. However, when food is scarce, they do much mischief to the farmers, by destroying the bark on the young trees in the nurseries, and by cutting valuable plants.

The flesh of the American hare, though of a dark colour, is much esteemed as an article of food. During the summer season they are lean and tough, and in many situations they are infested by a species of *æstrus*, which lays its eggs in their skins, producing worms of considerable size. But in the autumnal seasons, and especially after the commencement of the frost, when the wild berries, &c. are ripe, they become very fat, and are a delicious article of food. In the north, during winter, they feed on the twigs and buds of the pine and fir, and are fit for the table throughout the season. The Indians

eat the contents of their stomachs, notwithstanding the food is such as we have just mentioned.

The American hare never burrows in the ground like the common European rabbit (*L. Cuniculus*). When confined in a yard, our animal has been known to attempt an escape by scratching a hole in the earth near the fence or wall, but there are few wild animals, whatever may be their characters, that will not do the same, under similar circumstances, though in their natural condition they may never attempt to burrow. Such is the fact in relation to the American hare, which never burrows while it is a free tenant of the fields and woods. It has been said that this animal also occasionally ascends trees, which must be understood solely of its going up within the trunks of hollow trees, which it effects by pressing with its back and feet against opposite sides of the hollow, ascending somewhat in the same manner that a sweep climbs a chimney.

The hare is not hunted in this country as in Europe, but is generally roused by a dog, and shot, or is caught in various snares and traps. In its movements our hare closely resembles the common hare of Europe, bounding along with great celerity, and would no doubt, when pursued, resort to the artifices of doubling, &c. so well known to be used by the European animal. The American hare breeds several times during the year, and in the southern states even during the winter months, having from two to four or six at a litter.

In summer pelage the American hare is dark brown on the upper part of its head, a lighter brown on the sides, and of an ash colour below. The ears are wide and edged with white, tipped with brown, and very dark on their back parts; their sides approach to an ash colour. The inside of the neck is slightly ferruginous; the belly and the tail is small, dark above, and white below, having the inferior surface turned up. The hind legs are covered with more white than dark hairs, and both fore and hind feet have sharp pointed, narrow, and nearly straight nails.

In winter the pelage is nearly twice the length of what it is in summer, and is altogether, or very nearly, white. The weight of the animal is about seven pounds.

This species is about fourteen inches in length. The hind legs are ten inches long, by which circumstance it is most strongly distinguished from the common rabbit of Europe.*

* "The hare and rabbit so nearly resemble each other in form and structure, that it has puzzled the most experienced zoologists to assign definite distinguishing marks. Yet there are many circumstances in which they differ (besides the colour of their flesh when boiled, and

SPECIES II.—*The Polar Hare.**Lepus Glacialis*; SAB.*Lepus Glacialis*: LEACH. Miscel. SABINE, App. to Franklin, p. 664; *Id.* App. to Parry's voyage of 1819, 1820.

The Polar Hare is found in greatest abundance at the extreme northern part of this continent, along the southern coast of Barrow's strait, and in the North Georgian islands. Capt. Sabine, who found the animal in considerable numbers on Melville islands, has pointed out, in the Appendix above quoted, (whence the following description is taken) the differences existing between this species and the *L. Variabilis*, with which it had been previously confounded.

The polar hare is larger than the alpine or varying hare, next to be described, and weighs about eight pounds. Its colour, in winter dress, is white, having the ears black at their tips and longer than the head. The nails are strong, broad and depressed.

"The ears are longer, in proportion to the head, than those of the common hare, (*L. Timidus*) and much longer than those of the alpine hare (*L. Variabilis*). The ears of the common hare are usually considered one-tenth longer than the head, those of the present species are from one-fifth to one-seventh. The fore teeth are curves of a much larger circle, and the orbits of the eye project much more than those of either of the other species; the claws are broad, depressed and strong: those of the *L. Timidus* and *Variabilis* being, on the contrary, com-

their manner of escaping from their foes) in reference to their reproductive system. The nest of the hare is open, constructed without care, and destitute of a lining of fur. The nest of the rabbit is concealed in a hole of the earth, constructed of dried plants, and lined with fur pulled from its own body. The young of the hare, at birth, have their eyes and ears perfect, their legs in a condition for running, and their bodies covered with fur. The young of the rabbit, at birth, have their eyes and ears closed, are unable to travel, and are naked. The maternal duties of the hare are few in number and consist in licking the young dry at first, and supplying them regularly with food. Those of the rabbit are more numerous, and consist of the additional duties of keeping the young in a state of suitable cleanliness and warmth. The circumstances attending the birth of a hare are analogous to those of a horse, while those of a rabbit more nearly resemble the fox."—FLEM.—*Philosophy of Zoology*, ii, p. 140.

The rabbit is not a native of this country, but has frequently been introduced in a domesticated state, from England, &c. The species above described we have already stated to be improperly called "the rabbit."

pressed and weak; the hind leg is shorter, in proportion to the size of the animal, than in the alpine, (*Variabilis*;) the fur is exceedingly thick and woolly, of the purest white in the spring and autumn, excepting a tuft of long black hair at the tip of the ears, which is reddish brown at base; the whiskers are also black at the base for half their length. In some of the full grown specimens, killed in the height of summer, the hair of the back and sides was a grayish brown towards the points, but the mass of fur beneath still remained white. The face and the front of the ears were a deeper gray; the fur is interspersed with long, solitary hairs, which in many individuals were, in the middle of summer, banded with brown and white. The hares which Mr. HEARNE describes in his northern voyage, as inhabiting the continent of America, as high as the seventy-second degree of latitude, are stated to weigh fourteen or fifteen pounds when full grown and in good condition. The largest hare killed at Melville island did not weigh nine pounds; were it not for this difference in size, they might be supposed, from other parts of their description, to be the same species.*

Through the kindness of that zealous friend of science, CHARLES L. BONAPARTE, we have had an opportunity of examining and preparing a description of a hare, from specimens in winter and summer pelage, belonging to his valuable collection. This species, which appears to be the same with that indicated by Lewis and Clarke, and after them by Warden, has also been *proposed* as a new species, under the name of *Lepus Virginianus*. That it is a species distinct from the *L. Glacialis* and *Variabilis*, remains yet to be established, since differential characters have not been adduced to prove the fact.—We shall first give a description of the animal in summer and winter dress, and then examine whether any differential characters have been given, or, under existing circumstances, can be offered, to entitle it to rank as a new species.

The general colour of this hare, in summer dress, is a light reddish brown, which is lighter on the breast and head, becom-

* In the Appendix to Franklin's Journey, p. 665, we have the following observations on this species:—"The polar hare appears to vary much in size, and consequently in weight; this, perhaps, may be caused by the quantity and quality of the food it can command. Dr. Richardson observed that the polar hare is never seen in woods; it frequents the barren grounds, living chiefly on the berries of the *arbutus alpina* and the bark of a dwarf birch. It sits, like the common hare, on the whole length of the metatarsal bones, but in running, its hind feet make a round print in the snow, similar to that made by the fore ones."

ing darker from the superior parts of the shoulders to the posterior parts of the body. The hairs are coloured in the following manner;—They are plumbeous at base, then light yellowish, then dusky, then reddish brown, and finally black at tip. The under jaw is white, and this colour extends backwards until opposite the bases of the ears. The belly and legs are white, faintly tinged with light reddish brown; the tail is whitish, which colour is superiorly mingled with bluish or lead colour. The ears are externally bluish white, and darker at tip; internally they are of a faint reddish white.

The following measurements of a recent specimen of this animal, were carefully made by the distinguished individual before mentioned :

Total length,	-	-	-	-	-	2 ft. 7 in.
Height to the top of the fore shoulder,	-	-	-	-	-	" 10
——— to the top of the thigh,	-	-	-	-	-	1 2
Length of the head,	-	-	-	-	-	" 4
——— of the ears,	-	-	-	-	-	" 4
Distance from the eyes to the end of the nose,	-	-	-	-	-	" 1 $\frac{1}{4}$
Length of the fore arm,	-	-	-	-	-	" 4
——— of the fore paw,	-	-	-	-	-	" 2 $\frac{1}{4}$
——— of the thigh,	-	-	-	-	-	" 6
——— of the hind foot,	-	-	-	-	-	" 6
——— of the tail,	-	-	-	-	-	" 1 $\frac{1}{2}$

In winter dress the general colour is pure white, the fur being long, soft, fine, and in greatest quantity upon the breast. The hairs in the summer, as in winter pelage, are plumbeous at base, but are then reddish, and at tip of a snowy whiteness. The ears are slightly tipped with dark lead colour, and edged within by brown and white hairs intermixed. The whiskers are entirely white, or black at base and white at tip. The feet are thickly clothed with hair, which conceals the slightly curved nails, which are long and narrow at base.

When we compare this animal with the polar hare, *L. Glacialis* of Sabine, and with the *L. Variabilis*, or alpine hare, we shall be convinced that distinctive characters have not yet been given to establish the supposed new species, as well as that such distinctive characters are very few and difficult of discovery.

The essential or distinctive characters ascribed by Sabine to the polar hare, are as follows :—Colour white, ears black at tip, longer than the head; nails robust, broad and depressed.

The essential characters of the *L. Variabilis*, as given by Desmarest, are,—pelage grayish yellow in summer, white in winter; ears shorter than the head, and black at all times; tail white in winter and gray in summer.

The "characters essential" given of the animal under consideration as a *new species*, entitled *Lepus Virginianus*, are as follows:—"Grayish brown in summer; the orbits of the eyes surrounded by a reddish fawn colour at all times; ears and head of nearly equal length; tail very short."

As the colour of the pelage is common to several species, both in summer and winter, it is peculiarly insufficient as a differential character in the establishment of the proposed new species. The second character laid down in the last definition, concerning the permanent fawn colour surrounding the orbit, is incorrect. One of the specimens above described has the orbits of the eyes surrounded by a very different colour; neither is the statement, that the ears are *nearly* equal in length to the head, of any avail in establishing the specific difference, since the ears of the *Variabilis* are also *nearly* equal in length to the head, being somewhat shorter. If it be meant that the ears of the supposed new species are, in the same sense, nearly of the length of the head, it is incorrect, since the head of the animal in its recent state measured four inches, and the ears were of the same length. The shortness of the tail is as characteristic of the *Variabilis*, in which it is but one inch and three-quarters, while the proposed new species has a tail one inch and a half long.

In the present state of our knowledge, the only truly differential character that can be given is the equality existing between the length of the ears and head. The toe-nails differ from those of the polar hare described by Sabine, but they are very similar to those of the common hare, and may also be similar to those of the *Variabilis*, which are not minutely described, even by Desmarest; hence no positive conclusion can be deduced. Neither can the relative height of the hind and fore parts aid in distinguishing this hare from the alpine, (*L. Variabilis*) in which the hind are to the fore parts as fourteen to twelve, while in the proposed new species the proportion is the same, being as twelve to ten; the polar hare (*L. Glacialis*) has the hind limbs proportionally shorter than the *Variabilis*, though their actual length is not given: this being equally true of the supposed new species, we cannot infer any specific difference therefrom. The weight of these hares is a circumstance equally inefficient in deciding this doubtful matter; the polar hare weighs from seven to nine pounds, (*Sab.*)—the alpine seven to seven and a half, (*Penn.*)—the hare described by Lewis and Clarke, seven to eleven pounds. The weight given by the latter observers inclines us to believe that this animal is the same as that described by HEARNE, as the va-

rying hare, which SABINE says differs from the polar hare only in weight.*

In the specimen in summer dress (which we have described in beginning this article) the tail is nearly white, and in the hare observed by LEWIS and CLARKE, presently to be quoted, the tail was likewise white during the summer. Should this colour of the tail prove to be uniformly permanent, it may be added to the only other differential character, drawn from the ears. But until more decisive evidence can be adduced, it will be safest to consider this hare as at most a variety of the alpine hare, the *Lepus Variabilis* of authors.

It is found throughout the mountainous regions of the Union, and on the plains and in the woods of the western territories. To the north it is known as far as observation has yet extended. LEWIS and CLARKE, in the second volume, p. 178, of their extremely interesting journal, give the following account of this animal:—"The hare on the western side of the Rocky Mountains inhabits the great plains of the Columbia. On the eastward of those mountains they inhabit the plains of the Missouri. They weigh from seven to eleven pounds; the eye is large and prominent, the pupil of a deep sea-green, occupying one third of the diameter of the eye; the iris is of a bright yel-

The following is HEARNE's account of this animal:—"The *varying hares* are numerous, and extend as far as latitude 72 deg. N., probably farther. They delight most in rocky and stony places, near the borders of woods, though many of them brave the coldest winters on entirely barren ground. In summer they are nearly of the colour of our English wild rabbit, but in winter assume a most delicate white all over, except the tips of the ears, which are black. They are, when full grown and in good condition, very large, many of them weighing fourteen or fifteen pounds; and if not too old, are good eating. In winter they feed on long rye grass and the tops of dwarf willows, but in summer eat berries and different sorts of small herbage. They are frequently killed on the south side of Churchill river, and several have been known to breed near the settlement at that place. They must breed very fast, for, when we evacuated Prince of Wales's fort, in 1783, it was common for one man to kill two or three in a day, within three miles of the new settlement. But partly, perhaps, from so many being killed, and partly from the survivors being so frequently disturbed, they have shifted their situation, and at present are as scarce near the settlement as ever. The northern Indians pursue a singular method of shooting those hares; finding, by long experience, that these animals will not bear a direct approach, when the Indians see a hare sitting, they walk round it in circles, always drawing nearer at every revolution, till by degrees they get within gun-shot. The middle of the day, if it be clear weather, is the best time to kill them in this manner; for before and after noon the sun's altitude being so small makes a man's shadow so long on the snow as to frighten the hare before he can approach near enough to kill him."—8vo. ed. p. 385.

low and silver colour; the ears are placed far back and near each other, which the animal can, with surprising ease and quickness, dilate and throw forward, or contract and hold upon his back at pleasure; the head, neck, back, shoulders, thighs, and outer parts of the legs and thighs, are of a lead colour; the sides, as they approach the belly, become gradually more white: the belly, breast, and inner parts of the legs and thighs are white, with a light shade of lead colour; the tail is round and bluntly pointed, covered with white soft fur, not quite so long as on the other parts of the body; the body is covered with a deep, fine, soft, close fur. The colours here described are those which the animal assumes from the middle of April to the middle of November; the rest of the year he is of a pure white, except the black and reddish brown of the ears, which never changes. A few reddish brown spots are sometimes mixed with the white, at this season, (February 26) on their heads and the upper parts of their necks and shoulders; the body of the animal is smaller and longer, in proportion to its height, than the rabbit; when he runs he conveys his tail straight behind, in the direction of his body. He appears to run and bound with surprising agility and ease: he is extremely fleet, and never burrows nor takes shelter in the ground when pursued. His teeth are like those of a rabbit, (*L. Americanus*), as is also his upper lip, which is divided as high as the nose. His food is grass, herbs, and in the winter he feeds much on the bark of several aromatic herbs growing on the plains. Capt. LEWIS measured the leaps of this animal, and found them commonly from eighteen to twenty-one feet; they are generally found separate, and never seen to associate in greater numbers than two or three."

WARDEN, in a note to his "Description des Etats Unis," p. 632, says "the varying hare of the southern parts of the United States is distinguished from the American rabbit (*Lupus Americanus*) by changing from a gray brown, which is its colour in spring and summer, to a full white in winter. Its ears are also shorter and marked with black, and its legs more slender. The largest varying hares are about eighteen inches long, and weigh from seven to eight pounds. They are very prolific, as the female litters several times a year, having three or four young each time. The flesh of this animal is represented to be agreeable and nutritious. It frequents the marshes and prairies, but never burrows; its colour is similar to that of the European rabbit, and the female equally conceals her young from the male. When pursued, they mount as high as possible, within a hollow tree."

CHAPTER V.

ORDER IV.—BRUTA ; * L. *Animals destitute of Cutting-Teeth.*

IN North America no living animal belonging to this order has yet been found, but gigantic fossil remains of extinct species have been occasionally disinterred in different parts of the Union. The circumstance first stated may appear the more singular when the fact is recollected, that the greater number of the living genera and species comprised by this order, are, at present, inhabitants of the southern divisions of this continent.

The animals of this order are characterized by the exceeding slowness of their movements, dependant on the singular structure and proportions of their limbs. They have the orbits of the eyes and the temporal cavities opening into each other, so as to form one cavity in the skeleton ; and their limbs are terminated by digets, (varying in number in different genera and species) armed with large and hoof-like claws. Such of the genera as have molar or jaw teeth, feed on bark of trees, &c. others, entirely destitute of teeth, feed exclusively on insects. Some of them use their claws for climbing and clinging to the branches of trees ; others for the purpose of burrowing.

* Brisson first established an order, under the title of *Edentata*, which comprised the animals having no teeth ; he made a second order of *Dentata*, embracing those possessed of molars : which division was adopted by Lacepede. Storr disapproving this arrangement, formed a single order of all these animals, which he called *Mutici*, and Boddart subsequently changed the name to that of *Edentes*, which was afterward changed to *Edentata* by Cuvier. Various changes have been proposed by other writers, founded on their peculiar views, (of the structure, &c. of these animals) which it is needless to detail. We have adopted the Linnean name for the order, as it conveys no incorrect idea, which all the others do, by calling the order TOOTHLESS, when only one genus is in that predicament. The place in the system of classification is that given to the order by Cuvier, because these beings have some analogy to the digitigrade animals, in the circumstance of their toes being terminated by large and long claws, &c.*

* Vedi RANZANI ; *Elementi di Zoologia*, tomo II. do. parte II. da. p. 473.

FAMILY I.—TARDIGRADA ; *Sloths*.GENUS I.—MEGATHERIUM ; C. *Extinct Giant Sloth*.

GENERIC CHARACTERS.

Unlike the living members of this family, the present genus has complete zygomatic arches, yet it again closely resembles the existing genera in having at the anterior basis of the zygoma, a large descending process. The bones of the upper jaw are much prolonged ; the nasal bones are very short : the lower jaw has very large ascending branches, and at its anterior extremity, or chin, it is salient, and hollowed within. The spine, composed of twenty-six vertebræ, has seven belonging to the neck, sixteen to the back, and three to the loins. It cannot be positively stated that these animals had no tail, though it is probable ;—if it did exist, it is presumed to have been very short. The posterior limbs exceed the anterior in size considerably ; all the feet have five toes, yet three only on the fore feet are provided with large claws, the other two being rudimental. On the hind feet but one toe is furnished with an enormous claw ; the other four are nearly rudimental.

Dental System.

16 Teeth: { 8 Upper } Molars.
 { 8 Lower }

“The twelve posterior teeth are larger than the others, each of them being nearly two inches square ; they present rounded angles, and between each of these angles there is a small canal. Each tooth has four angles, two internal and two external. The lower part, which is imbedded in the alveolar process, diminishes gradually, becoming only two inches broad, of a square form, having beneath a pyramidal cavity separated by four points, which buries itself sufficiently forward in the tooth. The four first teeth weighed exactly twenty ounces ; the others as much as twenty-six.”*

“Their remarkable structure, so much unlike any before observed, is still more deserving of particular description. The tooth is covered externally with a coating of enamel, extremely thin, and uniformly so on all sides, and which does not extend

* Don Juan B. Bru ; description of the skeleton from Paraguay, in the Madrid Museum ; translated by Bonpland in Cuv. Oss. Foss. tom. iv.

over any part of the crown. Within is a coating of bone or ivory, which, at the sides of the tooth, is as thin as the enamel; but where it is parallel to the cutting edges, is nearly a quarter the thickness of the whole tooth. Enclosed within this is a second coating of enamel, which, like the first two, has two sides very thin. The other two sides are more than a line thick, and terminate in the cutting process, which by this means are kept constantly sharp and prominent, by the wearing away of the softer ivory on each side of them. Where these laminae of enamel terminate on the anterior side of the higher process, may be observed a semilunate truncation, which is not seen on the lower process, although terminated in a similar manner. The whole solid part of the tooth thus represents a prism of bone, enveloped within three cases, two of enamel, and the third of a substance similar to itself.*

[That the reader may be better prepared to understand the peculiar character of these fossil remains, we subjoin CUVIER's observations on the construction of the existing animals, to which these extinct species were closely allied, and which they must have resembled in all their general habits, as well as in conformation. This comparison may also prove of advantage to the inquirer, (independent of satisfying him of the correctness of the opinions advanced, relative to the similarity of these animals) should it awaken his curiosity to become better acquainted with the works of the great naturalist quoted. His writings, though principally occupied with the relics of former worlds—with animals that ceased to be before the foundations of human society were laid, nevertheless overflow with the energies of an immortal intellect, and expand the mind of the student with those sublime ideas of the God of nature, which are not to be equalled by any mere effort of imagination, since they are inspired by the most extraordinary facts, beheld under the powerful illumination of disciplined genius.

"In considering these beings, we find so few relations with ordinary animals—the general laws of existing organizations apply so little to them—the different parts of their bodies are so much in contradiction of the rules of co-existence established throughout the animal kingdom, that we might really believe them to be the remains of another order of beings, the living fragments of that antecedent nature, whose other ruins we are obliged to seek in the bosom of the earth, which by

* Annals of the Lyceum of Natural History of New York, vol. i. p. 114. A highly interesting paper by W. Cooper on the *Megatherium* found in Georgia.

some miracle have escaped the catastrophies that destroyed their cotemporary species.

"With the solitary exception of the elephant, there is not, perhaps, among all the quadrupeds, an animal which so widely departs from the general plan of nature, in the formation of that class, as the sloths; still, the deviations from that plan correspond with each other so reciprocally as to correct their bad effects, and produce a concordant whole; but in the sloths, each singularity of organization appears to have no other result but weakness and imperfection, and the inconveniences they cause the animal are not compensated by any advantage.

"The mere aspect of the skeleton of the *ai* (three-toed sloth), in some sort indicates deficiencies of proportion. The arms and fore arms taken together are almost twice as long as the thigh and leg, so that when the animal moves on all four limbs it is obliged to crawl upon its elbows, and when it raises itself upon its claws, the entire hand may still be placed against the ground. There are some apes alone which approach this disproportion; but they often keep themselves erect, or walk with the aid of a staff, which cannot be done by the *ai*, since its hind feet are so peculiarly articulated that they cannot sustain the body. The pelvis, moreover, is so large, and the cotyloid cavities (or sockets for the heads of the thigh bones) are turned so far backwards, that the knees cannot be brought together, and the thighs are kept forcibly separate.

"Animals, when they run, receive their principal impulsion from their hind feet; hence, the best runners have the longest hind legs, as the hares, jerboas, &c. The length of the fore legs serve merely to embarrass, and hence crabs are forced to move backward. Sloths can scarcely employ their fore limbs, except for the purpose of clinging to objects and then dragging forwards their hinder parts.

"In the other quadrupeds, the *os sacrum* is only attached to the ossa ilia, or haunch bones, by a small portion of its sides in front; all the rest is free, and the interval between the posterior part of the sacrum and ossa innominata is vacant, for the reception of the muscles and other soft parts, bearing the name of the great ischiatic notch. In the sloth there is a second posterior union between the sacrum and tuberosity of the ischium, and instead of the ischiatic notch there is nothing but an opening like a second obturator foramen.

The joint which attaches the hind foot and leg, "appears to be expressively arranged to deprive the animal of the use of the foot." In other animals the articulation is such as to allow the foot to be flexed upon the leg, but the foot of the sloth turns upon the bones of the leg "like a weathercock upon

its pin, but cannot be flexed. Hence it results that the body of the foot is nearly vertical when the leg is so, and that the animal cannot place the sole of the foot on the ground unless by separating the leg so far as to render it almost horizontal. From these two peculiarities the absolute weakness of the foot is derived, and the total impossibility of its affording a solid point of support to the body." On the fore and hind feet "the skin envelopes all the parts except the nails, which are separate, and the whole of the remainder of the digits is united, being without interval or mobility between them; they, therefore, can only be flexed or extended together.

"The nails of the sloth are of an enormous length, and the dreadful weapon they furnish is doubtless the mean by which these animals defend themselves with sufficient success to compensate for all the disadvantage of the rest of their organization. Nearly as sharp as those of the cat, it is necessary for their preservation in that condition that they should be protected from friction against the ground. It is by withdrawing them between their toes, having the points turned upwards, that those of the cat are preserved. The sloths cannot do the same, because their digits, being united by the integument, leave no interval; besides, these long reverted points would be very inconvenient, and might wound the throat and belly. When not in use they are kept recurved, and placed with their convexity on the ground; this, as in the cat, is effected without fatigue to their muscles, and by the simple elastic action of the ligaments; the muscles have only to act to extend them.

"From this difference, another results in the form of the articulation. The last phalanges of the cat, like those of the sloth, are at the back part hollowed into an arc of a circle, since they must move as pulleys upon the next to the last bone. But in those of the cat the most salient part of the arc is below; in the sloth it is above, always on the side towards which the nail is not carried. By this circumstance we may distinguish, at the first glance, even a single phalanx of either of these genera. We may also distinguish them by the osseous sheath which retains and overlaps the base of the nail. Both genera equally have them, because both require solidity in so long a weapon; but in the sloth it is the lower part of this sheath which is the most prolonged, while in the cat it is rather the superior part."*]

* Recherches sur les Oss. Foss. tom. iv.

SPECIES I.—*Cuvier's Giant Sloth.**Megatherium Cuvieri.*

Megathère: C. Ann. du Mus. v. 176, pl. 24, 25. Recherches sur les Ossem. Foss. tom. iv. BRU, Descr. &c. trad. par Bonpland, Ejusdem, tom. iv. Descr. d'un squelette conservé dans le Mus. de Madrid; trad. de Garriga. MITCHILL; Ann. of the Lyceum of Nat. History of New-York, vol. i. COOPER on the *Megatherium* of Georgia, Ann. Lyceum, vol. i.
Megatherium Cuvieri: DESM. Mammal. 365.

The first discovered skeleton of this extraordinary animal was obtained from some excavations made on the banks of the river Luxan, near a town of the same name, situated about three leagues W. S. W. of Buenos Ayres. It was found at the depth of a hundred feet from the surface, in a sandy soil, and is the most perfect specimen of this animal yet procured. It was sent to Spain by the viceroy of Buenos Ayres, the Marquis of Loreto, where it was mounted in the Museum of Madrid by Don. J. B. BRU, who first published a description of it. Another specimen was sent to the same cabinet in 1795, from Lima, and a third was discovered in Paraguay.* The only skeleton yet found in North America was first indicated by our celebrated countryman, Dr. MITCHILL, and subsequently more fully detailed by that ardent votary of natural science, W. COOPER, of New York, in the work above quoted. Having but a few mutilated fragments of this skeleton in the cabinets of this country, it is impossible, by describing them alone, to give the reader any proper idea of the animal. We shall therefore introduce CUVIER's account of the species, drawn up principally from the work of Garriga, and add thereto the observations made on the American specimen recently discovered in Georgia.

"A first glance at the head of the megatherium, gives us the most marked relations with that of the sloth, especially the *ai* (three-toed sloth.) The most striking feature of resemblance, is the long descending apophysis placed at the anterior base of the zygomatic arch. It is proportionally as long in the *ai* as in the megatherium; but the latter has the zygomatic arch entire, while in both species of sloth, even when adult, it is not continuous.

"The ascending branch of the lower jaw sufficiently resembles that of the sloth, but its inferior part forms a convexity, to which we find but a slight resemblance even in that of the elephant. The osseous snout is more salient in the mega-

* Garriga, as quoted by CUVIER.

therium than in the *ai*; this arises from an advance of the symphysis of the lower jaw, (chin,) which is also found in the two-toed sloth (*unau*), and from a corresponding advance of the intermaxillary bones. The bones of the nose are very short, which, after the example of the elephant, and tapir, might lead us to suspect that this animal had a trunk.

"This might also be inferred from the multitude of holes and small canals with which the anterior part of the snout is pierced, which must have served to give passage to vessels and nerves, destined to nourish some organ of considerable size. However, if such a trunk existed, it was doubtless very short, judging by the length of the neck, which appears very natural, and not owing to the introduction of vertebræ, belonging to larger individuals in forming the skeleton. The head not being disproportionately large, and especially being without tusks, a long neck would not be as prejudicial as it would have been in the elephant.

"The molar teeth are four in number, on each side, both above and below, as in the *ai*, and, like the teeth of that species, of a prismatic form, and the crown traversed by a groove. They are only closer together, and have no pointed canine in front, as the *ai* has one at least in the upper jaw, and the *unau* in both upper and lower. Yet that is scarcely sufficient to distinguish a genus, for in the *unau* itself the canines differ little from the molars, which are as pointed as in that species.

"If the number of seven cervical vertebræ, seen in this skeleton, be correct, as analogy with other animals induces us readily to believe, the megatherium differs much in this respect from the three-toed sloth, which itself is separated from all known quadrupeds by the length of its neck. The megatherium has sixteen dorsal vertebræ, and by consequence, sixteen ribs on each side, and three lumbar vertebræ. The number is exactly the same in the *ai*.

"The relative proportion of the extremities is not the same as in the sloth, where the anterior have nearly double the length of the posterior limbs: in this animal the inequality is much less. But in return, the disproportionate thickness of the thigh and leg bones (indications of which are found in the sloth, tatous, and especially the pangolins) is carried here to an excessive degree, the thigh-bone being in height only double its greatest thickness, which renders it larger than that of any other animal known, not excepting the mastodon.

"This general disposition of the extremities leads to the conclusion that this animal had a slow and equal gait, and advanced neither by running nor leaping, like animals having the fore limbs shorter, nor in crawling, like those which have them

longer, and especially the sloths, to which they otherwise are so closely similar. The shoulder-blade has, generally, the same proportions as those of the sloths. It has a clavicle, as in one of them, (the two-fingered or *unau*,) which, together with the length of the phalanges supporting the nails, proves that this animal also employed its fore feet to seize and even to climb with. The presence of clavicles separates our giant sloth from all the animals which might be confounded with it on account of their size, as the elephant, rhinoceros, and all the large ruminants, none of which have these bones.

"The arm of the megatherium is very remarkable for the breadth of its inferior part, which is owing to the great surface of the spines placed above its condyles. Hence, the muscles which originate there, and serve, as is known, to move the hand and fingers, must have been very considerable; this is another proof of the great use made by our animal of its inferior extremities. This great breadth of the lower part of the humerus is peculiarly found in the ant-eater, which is known to employ its powerful claws to suspend itself from trees, or to tear open the solid nests of the termites. It is in the ant-eater three-fifths of its length—while in our animal the breadth is one-half; which is also the proportion in the long-tailed scaly ant-eater, or *phatagin*. In the rhinoceros this breadth is only a third, and in the elephant a fourth, of the length. Ruminant animals, which scarcely make any use of their toes, have hardly any thing of these spines.

"The length of the olecranon (point of the elbow) must have given to the extensor muscles of the fore arm, an advantage which they have not in the sloths, whose olecranon is extremely short, which contributes not a little to the imperfection of their movements. The radius turns freely upon the ulna; but it should be remarked that this bone has been inverted in the skeleton, and the figures published, represent it in this erroneous manner. The shortness of the metacarpus, shows that the palm was entirely placed on the ground in walking. The digits, which were apparent, and armed with nails, were three in number, and the two others concealed under the skin, as there are two in the *ai*, three in the *unau* and two-fingered ant-eater.

"The last phalanges were composed of an axis, which carried the claw, and of a sheath which enclosed its base absolutely, as in the great clawed animals, compared with this. But the bones of the metacarpus were not solidified together, as they are in the *ai*. The proportion of these bones, as well as those of the *megalonix*, (*Jefferson's giant sloth*,) are very

different from those of the sloths, being the same as in the ant-eaters.

"The pelvic bones are very different in our animal from those of the kindred species. The haunch bones are the only ones preserved in the Madrid skeleton; they form a half pelvis, broad and hollowed out, the mid-plane of which is perpendicular to the spine, resembling somewhat that of the elephant, and especially of the rhinoceros. The broad part of these bones have a peculiarly striking analogy with that of the latter animal, by the proportion of its three lines; but their narrow part, and near the cotyloid cavity, is much shorter. This form of pelvis indicates that the megatherium had a large belly, and accords, with the form of the teeth, to indicate that its subsistence was vegetable matter.

"The pubis and ischium are wanting in the Madrid skeleton, but, in my opinion, these were lost at the time of the exhumation. However, if this defect be natural to the species, it is still an *edentous* animal (the two-toed ant-eater) that we find the first, though a slight indication of it. The ossa pubis and ischium of this ant-eater do not unite in front, and remain always separate.

"The tibia and fibula are united by bony matter at their two extremities, a circumstance absolutely peculiar to this animal; they present also by their union a disproportionately broad surface. In this respect the leg of the megatherium resembles considerably that of the *ai*, which is very broad, because its two bones each form a convexity on their sides, thus separating from each other. The figures lead to the belief that the articulation of the leg and foot is not so singular as it is in the *ai*, and that it is much more solid.

The megatherium having a broad astragalus, articulated with a tibia equally so, and strengthened farther by the lateral position of the fibula, stood more solidly than the sloths, and in this respect must have resembled most other quadrupeds.

"We find but a single toe on the hind feet of the Madrid skeleton, which was armed with claws; but in this respect I think there is less certainty than relative to the fore feet; especially as the figures represent but two other toes, which have no claws; and my researches have uniformly established as a rule without exception, that all unguiculated animals have five digits, whether externally visible, concealed beneath the skin, or reduced to simple osseous rudiments.

"The tail is wanting in the Madrid skeleton, and the smallness of the posterior face of the body of the sacrum, leads to the conclusion, that it was very short in this animal.

"The comparison of the bones of the megatherium and

megalonyx, (Jefferson's giant sloth) results in establishing almost the absolute identity of forms, at least in the parts yet discovered of the latter; but the size is different. The bones of the *megatherium* are a third larger than those of the *megalonyx*, and as the latter bear all the characters of the adult age, we can only attribute the difference of size to difference of species: we may add that the claw-sheaths are longer and more complete in the last phalanges of the *megatherium*. These two animals then should form two species of the same genus, belonging to the *Edentous* family, being intermediate to the sloths and ant-eaters, though nearer the former than the latter."*

After this long extract from CUVIER, we deem it most advantageous to the reader to present the account of the fragments of the North American specimen described in the *Annals of the Lyceum of Natural History of New York*, in a paper entitled "On the Remains of the *MEGATHERIUM* recently discovered in Georgia, by WILLIAM COOPER." In giving this paper nearly entire,† we feel satisfied that its zealous and scientific author will lose nothing by having his researches on this subject immediately contrasted with those of the illustrious zoologist above quoted.

"It has been already announced that remains of the great fossil animal of Paraguay exist within the limits of the United States, and under a latitude nearly as far north, as they have hitherto been found south of the equator. We are indebted for the first intelligence of this discovery, which possesses so much interest for the lovers of natural science, to our learned associate, professor MITCHILL, distinguished by his previous contributions to the knowledge of the fossil productions of this country. In a paper contained in the present volume of these *Annals*, that gentleman has given an account of two fragments of teeth brought to him from an island on the sea-coast of Georgia, which, at the same time that they differed totally from those of any quadruped now known to exist, presented the most striking resemblance to those of the *Megatherium*. To an animal of this very extraordinary, and now extinct species, he accordingly does not hesitate to refer them.

"The information thus given, however, was calculated rather to stimulate than to satisfy the curiosity of naturalists. Although the fact of these remains existing in North America

* *Oss. Foss. tom. iv.*

† We have already quoted, in the dental system of this species, a part of this paper. The comparison with Bru's description, &c. not being necessary at present, is also omitted.

might perhaps be considered as thereby established, yet its connexion with the most difficult problems in zoology and geology rendered it highly desirable to obtain other and more entire parts of the skeleton, and with them to institute a more extensive comparison. By means of this we might expect to discover any difference possibly existing between them, or else to determine, in the most unquestionable manner, the specific identity of the animal of Georgia with that of Paraguay.

"These considerations induced me to address a letter to my friend, *Dr. Wm. R. Waring*, of Savannah, begging him to make inquiry whether any more of these relics had been found, and, if possible, to procure me some of them. His answer informed me that his friend, *Dr. Joseph C. Habersham*, of the same place, had, with much trouble, and at some expense, assembled a collection of the bones found in the marshes of Skidaway Island, and at his request consented to allow them to be sent to this city, under the condition that they should be placed where they might be publicly viewed. They were transmitted to me in the month of March last, and in compliance with the wishes of the owner, are now deposited in the cabinet of the Lyceum.

The collection was found to consist of parts of several members of the skeleton, which, as nearly as their very mutilated and disconnected state would enable me to determine, were as follows :

"A portion of the posterior part of the *right* side of the lower jaw.

"Another portion which had been continuous with the preceding.

"A considerable portion of the anterior part of the same jaw.

"A fragment of the *left* side of the same jaw, about three inches square.

"Five fragments belonging to three different teeth.

"The vertebra dentata, with nearly one half broken off.

"Three other vertebræ, two of which appear to be dorsal, and the third either the last dorsal or the first lumbar. None of these are entire.

"A fragment undetermined, but supposed to be of the ilium.

"Eight pieces belonging to three or four different ribs.—Three of these pieces have the heads attached to them, and two seemed to have belonged to the left side, and the remainder to the right.

"The head of the lower extremity of the humerus, with both condyles nearly entire.

"Two pieces with a concavity at one end, perhaps the superior parts of a radius and ulna.

"A bone supposed to be tarsal, much broken.

"Two carpal bones adapted to each other.

"The heads of both femora; and a fragment, apparently the lower condyle of a femur.

"Part of a bone about seven inches long, supposed to be part of a fibula.

"Besides these were four or five other small pieces of bone, but so imperfect as not to be easily referred to their proper places in the skeleton.

"In addition to the foregoing should be enumerated the two fragments of teeth from which professor Mitchill drew up his description. On being compared with Dr. Habersham's collection, one of them was found to correspond with a fragment supposed to be of a *fourth* molar, of which it formed the posterior process. The other, as it fitted with great exactness into what remained of the socket of the *third* molar, appeared to have occupied that place in the jaw. Thus it is rendered extremely probable that all the relics of the *Megatherium* yet discovered, as far as we know, in North America, have belonged to a single individual.

"I shall first endeavour to bring together some of these fragments so as to show what has been their original state; after which they may be compared with the figure and description of the animal of Paraguay, as given by M. Cuvier in the *Annales du Museum*, vol. v., and in the *Recherches sur les Ossements Fossiles*, vol. iv. first edition.

"*Restoration of part of the lower jaw.*—A and B (see plate) formed one continuous piece. Of this there can be no doubt, as the edges of the fracture, though very irregular, correspond perfectly with each other. These two portions compose the greater part of the *right* side of the lower jaw, and contain parts of the sockets of all the four molar teeth.

"The plate represents two views of the jaw as partly restored, reduced to one-fifth their natural size. Fig. 1, is an oblique view of the inside of the jaw. Fig. 2, a profile of the outside. The dotted line represents the part supposed to be broken off.

"C also belongs to the lower jaw. It consists of the anterior part, comprising the symphysis, with part of the elongation, and parts of the sockets of the two first molars. It has been continuous with B.

"D (not in the plate) is a fragment of the *left* side of the same jaw. This is evident from its containing parts of the

sockets of the two last molars, part of the opening for the passage of the maxillary vessels, and the origin of the ascending branch of the jaw.

"The teeth had fallen out of all the sockets except one, which contained the body of the second molar with the crown and fangs broken off, apparently by recent violence. I attempted, therefore, to find the places of the four remaining teeth. Two of them I perceived to be alike in all respects, and therefore concluded that they had occupied corresponding situations in opposite sides of the jaw. Both are broken in two across, and consist of the crown and part of the body, as far down as below the commencement of the internal pyramidal cavity. The longer of the two is about four inches, the other somewhat less. On trying the first of these, it was found to fit with great exactness into the socket, of which part remains in B, and part in C, that is, the socket of the *first* molar. This, it may be observed, corroborates the approximation of these two fragments. Its form also showed this to have been its place; its diameter in the direction of its cutting edges being less than the contrary diameter, and its being narrowed anteriorly, proved its situation to have been in the thinner and more tapering part of the maxillary bone.

"The *second* molar of the same (that is, the *right*) side, remained in its socket as already mentioned. It is remarkable for its rhomboidal form, the diagonal through its left anterior internal, and right posterior external angle being the greatest.

"The remaining two teeth appeared to belong to the *left* side of the same jaw. One of them I conjectured to be the *third*; 1st, from its fitting into a part of this socket remaining in D; and 2dly, from its form, which shows the passage between the rhomboidal figure of the second molar, and the flattened shape of that which I suppose to be the *fourth*. This last is more flattened, that is, broader in the direction of its cutting edges than any of the others; and from this, as well from its agreeing with the form of the fourth socket, partly remaining in D, I have referred it hither. This tooth may, however, have belonged to the upper jaw.

"The fragments of teeth in Dr. Habersham's collection, for there is not one entire, agree with Bru's description of those in the skeleton of Madrid, so far, at least, as it is given in the French abridgment. There are the sockets of four on the right lower side, and consequently eight teeth in all, in the lower jaw, the six posterior being the greatest. They are square, with rounded angles, and a groove between on the inner and outer sides, and are longitudinally striated. The inferior pyramidal cavity may be observed with advantage in the

kind may be obtained at two other places, one called White-bluff, said to be also on the seacoast; the other is at some distance up the Savannah river. We may hope, through the zeal and exertions of the same gentleman, to whom the scientific public generally is so much indebted for the preservation of the remains which have formed the subject of these remarks, to have these interesting deposits further explored; and in a manner worthy of the great questions, which a proper examination of their contents would contribute so much to elucidate."

SPECIES II.—*Jefferson's Giant Sloth.*

Megatherium Jeffersonii.

Megalonyx: JEFFERSON, Transact. of the Am. Philos. Society, iv. 246.

Megalonyx: C. Annals du Museum, v. 358, pl. 23; Recherches sur les Ossements Fossiles, iv.

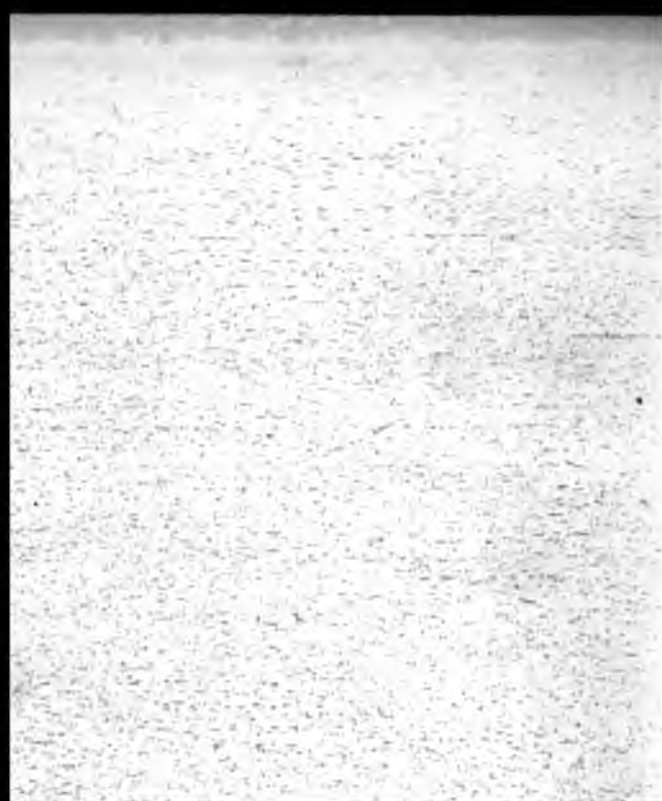
Megatherium Jeffersonii: DESM. Mammal. 366, Sp. 580.

To the author of the Declaration of American Independence, the scientific world is indebted for the first account of the extraordinary and interesting relics, which indubitably establish the fact, that at some very early period this country contained a second species of quadruped of gigantic size, resembling the sloths in structure and manners. The only fragments yet obtained of the skeleton of this extinct species were discovered in a saltpetre cave, belonging to Mr. Frederic Cromer, in Green Briar county, Va., where they were found about three feet below the surface of the cave's floor. "The importance of the discovery (says the distinguished author first above cited) was not known to those who made it, yet it excited conversation in the neighbourhood, and led persons of vague curiosity to seek and take away the bones. It was fortunate for science that one of its zealous and well-informed friends, Col. JOHN STEWART, of that neighbourhood, heard of the discovery, and, sensible from the description that they were not of any animal known, took measures without delay for saving those which still remained. He was kind enough to inform me of the incident, and to forward me the bones from time to time as they were recovered. To these I was enabled accidentally to add some others, by the kindness of Mr. Hopkins, of New York, who had visited the cave."

The bones thus obtained, consisted of a fragment of an arm or thigh bone, a complete radius, and an ulna, which was broken in two, but not otherwise injured; three of the pha-



Fig. 1. 2. 3. Bones of Jefferson's Giant Sloth
 Fossil Deer. & Fossil Deer. (See Supplement D. Vol. 3.)



lances on which the claws were sustained, and several bones belonging to the fore and hind feet.

In the absence of every opportunity for making a proper comparison of these bones, we are not surprised that JEFFERSON should, in the first instance, have compared them with the skeleton of the lion, as described by DAUBENTON; or that he should come to the conclusion that this unknown species was "more than three times as large as the lion; that he stood pre-eminently at the head of the column of clawed animals, as the mammoth stood at that of the elephant, rhinoceros and hippopotamus; and that he may have been as formidable an antagonist to the mammoth as the lion to the elephant." In a postscript to the same memoir, the author makes some observations on a very imperfect account of the *megatherium*, which prove that nothing but the want of proper materials for comparison prevented him from referring his *megalonyx*, or great claw, to its proper place.*

* "P. S. March 10, 1797. After the preceding communication was ready to be delivered in to the society, in a periodical publication from London, (Monthly Magazine, Sept. 1796,) I met with an account and drawing of the skeleton of an animal dug up near the river La Plate, in Paraguay, and now mounted in the cabinet of Natural History of Madrid. The figure is not so done as to be relied on, and the account is only an abstract from that of Cuvier and Roumé. This skeleton is also of the clawed kind, and having only four teeth on each side, above and below, all grinders, is, on this account, classed in the family of the unguiculated quadrupeds destitute of cutting teeth, and receives the new denomination of *megatherium*: having nothing of our animal but the leg and foot bones, we have few points of comparison between them. They resemble in their stature, that being twelve feet nine inches long, and six feet four and a half inches high, and ours, by computation, five feet 1.75 inches high; they are alike in the colossal thickness of the thigh and leg bones also. They resemble, too, in having claws; but those of the figure, appear very small, and the verbal description does not satisfy us, whether the claw-bone, or only its horny cover, be large. They agree, too, in the circumstance of the two bones of the forearm being distinct and movable on each other; which, however, is believed to be so usual as to form no mark of distinction. They differ in the following circumstances, if our relations are to be trusted:—The *megatherium* is not of the cat-form, as are the lion, tiger, and panther, but is said to have striking relations in all parts of its body, with the *bradypus*, *darypus*, *pangolin*, &c. According to analogy, then, it had not the phosphoric eye nor leonine roar. But to solve satisfactorily the question of identity, the discovery of fore teeth, or a jaw-bone, showing it [the *megalonyx*, or Jefferson's animal, both jaws of the *megatherium* having been figured,] had, or had not such teeth, must be waited for and hoped with patience. It may be better in the mean time to keep up the difference of name.—*Phil. Soc. Trans.* p. 259.

The late professor WISTAR, so justly distinguished for his zeal in the cause of science, drew correct, though not altogether positive conclusions, in relation to these bones. After giving a detailed description of them, he makes the following observations :—" From the shortness of the metacarpal bone, and the form and arrangement of the other bones of the paw, and also from the form of the solitary metatarsal bone, it seems probable that the animal did not walk on the toes; *it is also evident that the last phalanx was not retracted.* The particular form of the second bone, and its connexion with the first and third, must have produced a peculiar species of flexion in the toes, which, combined with the greater flexion of the last phalanx upon the second, must have enabled the animal to turn the claws under the soles of the feet; from this view of the subject there seems to be some analogy between the foot of this animal and that of the *Bradypus* [Sloth]—having no specimens of that animal, I derive this conclusion from the description of its feet given by M. DAUBENTON."*

CUVIER was the first to establish, from sufficient data, the true place and character of this animal; from all his comparisons and investigations, he lays down the following positions :

" 1st, That the animals which furnish these fossil bones, were not carnivorous ;—2d, That they had, in large, all the forms and all the details of organization that the sloths exhibit in small, and that the details of these organizations must have been similar ;—3d, That if they are separated from them in some unimportant particulars, it is only in approaching the nearest allied genus, that of the ant-eaters ;—4th, That the approximation of these fossil animals to the sloths, and their classification in the *Edentous* family, in general, are not arbitrary, nor founded on artificial characters, but that they are the necessary result of the intimate identity in the nature of both."

The great size of this animal, precludes the idea of its living upon trees, exactly in the manner of living sloths, but every thing discovered of its structure, forbids us from thinking that its mode of life was widely different. A sloth, of the size of an ox, would find few trees whose branches would be capable of sustaining so great a weight; but in not climbing it, would not differ more from the sloth than species of other genera do from each other.

We subjoin the measurements of these bones, and deem it unnecessary to describe them individually with minuteness.

* Ann. Phil. Trans. vol. iv. 530

The figures given in the plate will convey a better idea of them than we possibly could by words.

					Inches.
Length of the ulna,	-	-	-	-	20.1
Breadth to tip of its coronoid process,	-	-	-	-	9.55
—— in the middle of the bone,	-	-	-	-	3.8
Length of the radius,	-	-	-	-	17.75
—— at its head,	-	-	-	-	2.65
Breadth near the carpal extremity,	-	-	-	-	4.5*
Length of the metacarpal bone,	<i>a</i>	-	-	-	3.5
—— of the first phalanx,	<i>b</i>	-	-	-	1.25
—— of the second,	<i>c</i>	-	-	-	2.25
—— of the third,	<i>d</i>	-	-	-	7.

* Jefferson, in Philos. Trans. ut supra.

CHAPTER VI.

ORDER V.—BELLUÆ; L. *Dense Skinned A*

THE animals pertaining to this order cannot fly nor lay hold of objects, their feet being exclusive support their weight: they are, therefore, not provided with clavicles (collar-bones). The fore arm always in a state of pronation (with the palm against the earth). They feed on vegetable matters, and do not ruminate; the skin is membranous and simple, or merely divided by transverse bands.*

FAMILY. I.—PROBOSCIDA; *Having a Trunk and*

In the skeleton all the feet are distinctly five-toed; in the living animal these are entirely concealed by a thick, callous integument, which shows no external mark of articulation, except by the nails, which border this surface. There are no true incisive nor canine teeth in the skeleton, but two great tusks, growing from the intermaxillary bones, project externally and increase to a vast size. The large size of the sockets required for these tusks renders the skull so high, and shortens the bones of the nose so much, that in the skeleton the nostrils are found near the upper surface of the face; but in the living animal they are prolonged into a long, cylindrical trunk, composed of thousands of small muscles, interlaced, movable in every direction, and ending in a small, pointed tip.

tween its plates, by which a greater extent is given for the origin of muscles, without unnecessary increase of weight to the head. The lower jaw has no incisive teeth; the intestines are very large; the cæcum enormous; the teats, two in number, are placed upon the chest. The young of the elephant, the only living animal of this family, sucks with the mouth and not with the trunk.*

GENUS II.—MASTODON; *Mastodon*; C.

GENERIC CHARACTERS.

The form of the superior part of the head still remains unknown, the whole mass above the level of the zygomatic process being destroyed. The intermaxillary bones are long, and have at their extremities the openings of very large sockets for the tusks, which are very large and long. The lower jaw, ending in a point at the symphysis, is hollowed into a sort of canal; the neck is very short, the limbs long and five toed, and the ribs nineteen in number. The tail was moderately long.

Dental System.

10 Teeth:	} 6 Upper	{ 2 Incisive (in form of tusks) 4 Molar.
	} 4 Lower	{ 4 Molar.

The incisive teeth, very analogous to those of the elephant, are formed of ivory, which, when transversely cut, exhibits curvilinear lozenges, produced by the intersection of lines of a harder bony substance. The molars have rectangular crowns, somewhat straighter in the hind than in the fore teeth. They are composed of but two substances, the external being a thick enamel, and the internal bony matter, without cement or cortical substance, each tooth weighing about twelve pounds.

The crowns of these teeth are divided by very open trenches into transverse eminences, and each eminence is itself divided into two great, obtuse, irregularly formed points, constituting slightly rounded quadrangular pyramids. When the crown is not worn it is studded with knobs, or points disposed in pairs, from six to ten in number.

* Cuvier *Règne Animal*, i. 228.

SPECIES I.—*The Gigantic Mastodon.*

Mastodon Giganteum; C.

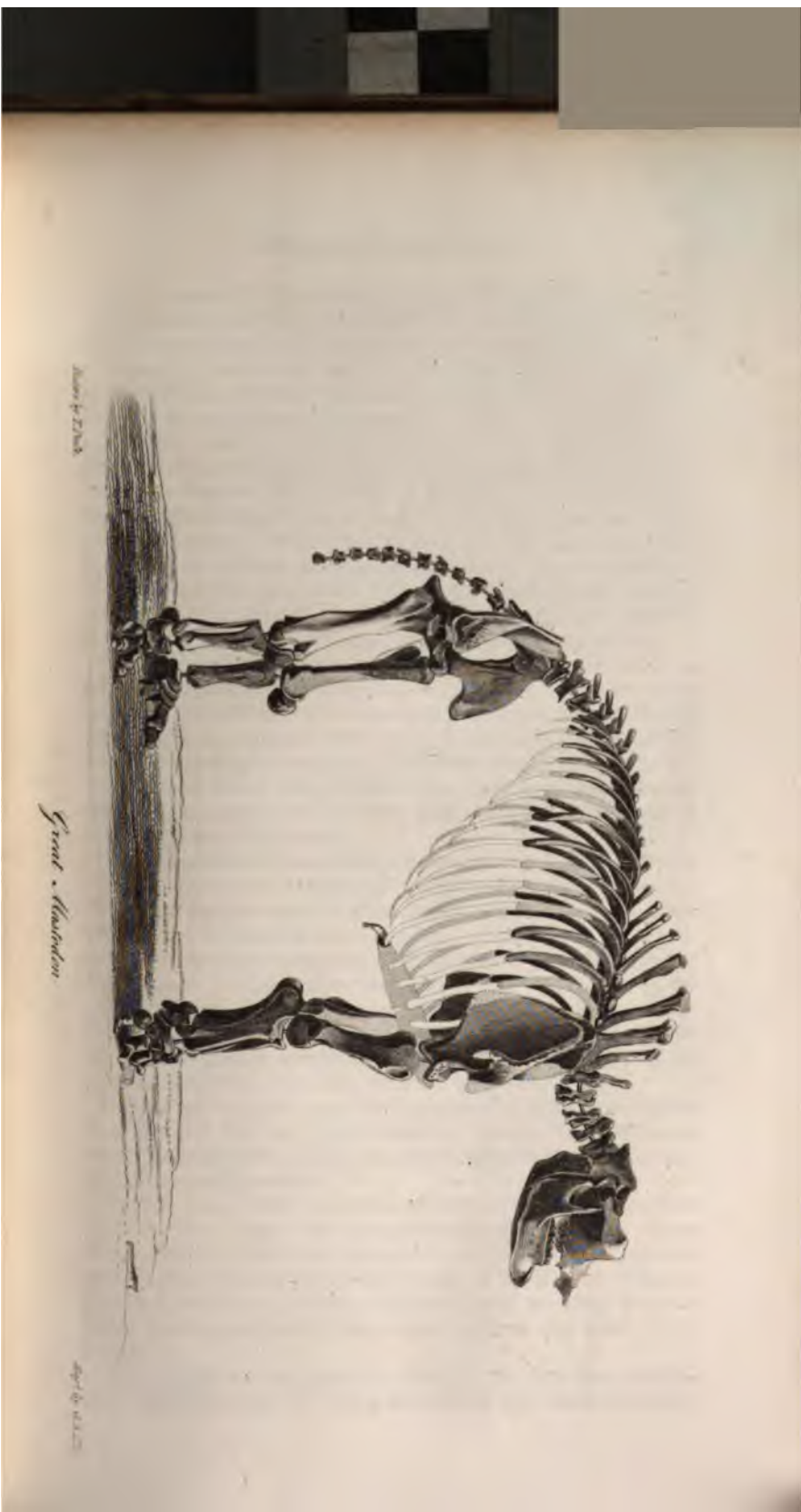
Animal Incognitum: REMB. PRALE, Account of the Skeleton of the Mammoth, 4to. 2d. ed. Lond. 1806.*Mastodon Giganteum*; C. An. du Mus. Recherches Sur les Oss. Foss. ed. 2, 1. p. 206.*Mastodon Giganteum*; Account of the Discovery of the Skeleton of the Mastodon Giganteum. Extracted from the report made to the Lyceum of Natural History, by Messrs. Dekay, Van Rensselaer, and Cooper. Annals Lyceum of Nat. Hist. of N. York, v. i. p. 143.

[Improperly called Mammoth.]

In various parts of North America single bones of extraordinary size had been occasionally disinterred, without exciting more than temporary curiosity, or leading to any thing better than wild and unsatisfactory speculation. Some persons regarded them as the relics of a gigantic race of men, of whose existence no other traces remained; others, who appeared willing to surpass all absurdity, suggested that they might have belonged to the *angels* who were expelled their celestial habitations: while a third, and more rational party, concluded that they were the bones of an animal still in existence, or belonged to a larger variety of the well known elephant species.—The inquiry generally ceased when the novelty of their discovery passed away; those by whom they were found were in pursuit of other objects, and very frequently neglected to preserve the fragments already obtained. But when situations were explored where they were procured in greater abundance, and the curiosity of European naturalists was awakened, these relics were eagerly sought for, until nearly a whole skeleton was obtained, the fact satisfactorily established that these bones belonged to a peculiar race never before known, and, what was still more surprising that the whole race was utterly extinct.

We find, as early as the year 1712, a letter from Dr. Mather to Dr. Woodward, published in the Philosophical Transactions, announcing that some bones and teeth of a monstrous size had been discovered at Albany, in New York.

In the year 1739, some savages belonging to the company of a French officer named LONGUEIL, who was descending the Ohio to the Mississippi, found, at a short distance from the river, at the edge of a marsh, some bones, grinders, and tusks, belonging to this unknown animal. The year after LONGUEIL took to Paris a thigh bone, the extremity of a tusk, and three grinders, which are still preserved there. Since that time these bones have been discovered in many places; though, in consequence of the notice first attracted by the specimens found on the Ohio



Drawn by Z. Beck

Great Auk

Fig. 1. p. 1. 1.

river, the name of Animal of the Ohio had been bestowed on this creature, yet this name, and that of *Mammoth*, have at length been entirely superseded by that proposed by CUVIER.

About the year 1740, vast numbers of these bones, which had been washed up by the current of the Ohio, or were purposely digged for, were found in Kentucky. The eagerness to procure them, and the haste with which they were sent to Europe, retarded the knowledge of the true character of the animal—as it became impossible to procure or recognize the bones belonging to different skeletons, or to determine their exact numbers and proportions. Over France, England and Germany, they were in this manner scattered in confusion; and we need not be surprised that naturalists were long in forming just ideas of the character of the animal, or indulged so much the disposition to maintain theories established on such slight foundations.

The force of prejudice may be clearly seen in the perseverance with which BUFFON, and some other scientific men, maintained that these bones belonged to a variety of the elephant race; for if he admitted that they did not belong to that kind, he must have acknowledged that they were bones of an extinct genus, which was an idea not then proposed, but has since most amply been proved true, and a vast number of extinct species discovered.

In consequence of some large bones having been previously found in Siberia, that were really *elephantine*, the idea readily became prevalent that the great bones of the Ohio and other parts of North America were similar. Hence the name *Mammoth* (said to be a corruption of the Hebrew word Behemoth) was applied to the American animal, and continued to be generally used, until the extreme difference of its structure induced naturalists to consider it properly, raise it to the rank of a distinct genus, and bestow on it a name expressive of its most striking characteristic, the form of the teeth.

It was not until the year 1801, a period of eighty-nine years from the first discovery of the bones at Albany, that any hopes were entertained of finding an entire skeleton of this wonderful and interesting animal.

In the year 1824, a considerable part of a skeleton was raised in New Jersey by some scientific gentlemen of New York; but they have not discovered any thing more than was previously made known by the exertions of Messrs. PEALE; the head, which is the only important part wanting, was too much decomposed to enable them to form any idea of its figure.

The emotions experienced, when for the first time we behold the giant relics of this great animal, are those of unmin-

gled awe. We cannot avoid reflecting on the time when this huge frame was clothed with its peculiar integuments, and moved by appropriate muscles; when the mighty heart dashed forth its torrents of blood through vessels of enormous caliber, and the mastodon strode along in supreme dominion over every other tenant of the wilderness. However we examine what is left to us, we cannot help feeling that this animal must have been endowed with a strength exceeding that of other quadrupeds, as much as it exceeded them in size; and, looking at its ponderous jaws, armed with teeth peculiarly formed for the most effectual crushing of the firmest substances, we are assured that its life could only be supported by the destruction of vast quantities of food.

Enormous as were these creatures during life, and endowed with faculties proportioned to the bulk of their frames, the whole race has been extinct for ages. No tradition nor human record of their existence has been saved, and but for the accidental preservation of a comparatively few bones, we should never have dreamed that a creature of such vast size and strength once existed,—nor could we have believed that such a race had been extinguished for ever. Such, however, is the fact—ages after ages have rolled away—empires and nations have arisen, flourished, and sunk into irretrievable oblivion, while the bones of the mastodon, which perished long before the periods of their origin, have been discovered, scarcely changed in colour, and exhibiting all the marks of perfection and durability.

That a race of animals so large, and consisting of so many species, should become entirely and universally extinct, is a circumstance of high interest;—for it is not with the mastodon as with the elephant, which still continues to be a living genus, although many of its species have become extinct:—the entire race of the mastodon has been utterly destroyed, leaving nothing but the “mighty wreck” of their skeletons, to testify that they once were among the living occupants of this land. Into the probable causes of this extinction, we shall hereafter make a fuller inquiry.

The situations whence these bones have been most commonly obtained, appear to have greatly contributed to their preservation. They have generally been dug from beneath a considerable mass of mud, or marle, where they have long soaked in fluids charged with saline and other impregnations. Thus they have been equally protected against the effects of detrition and vicissitudes of weather, and most of the bones found are in every respect perfect, with the exception of an unimportant change in colour. This circumstance is almost

universally observed of the bones contained in the different cabinets of this country; when scraped or cut, they exhale an odour remarkably similar to that produced by the same treatment of a recent bone.

There are several circumstances leading us almost to despair of ever procuring the upper part of the skull, which, on account of its comparative thinness and weakness, as well as the fact of its being always found much nearer the surface, must be among the first parts to decay, and be irrecoverably lost. No specimen has yet been obtained more perfect than the one in the Philadelphia Museum, and this has no part of the skull above the level of the zygomatic arches. In this, as in all the individuals discovered, the top of the head was so far decayed and destroyed as to prevent the least idea being formed as to its figure or elevation.

Enough of the head has fortunately been preserved to make us fully acquainted with the dentition of this great animal, and enable us to decide on the general nature of its food and habits of living. Without the aid derived from this source we should still be in doubt, and have nothing to guide us to a satisfactory conclusion, although the analogy in size and general configuration might have served to produce the inference, that the animal was, in other respects, most nearly allied to the elephant, rhinoceros, or hippopotamus.

The circumstances attending the exhumation of the most perfect skeleton ever obtained, of this great animal, are deeply interesting to every votary of natural science; and the author believes that he cannot more effectually minister to the gratification of his readers, than by introducing in this place the account written by his father-in-law, an eye witness and enthusiastic co-operator in that enterprise, which has secured to the scientific world one of its most interesting and instructive possessions. In addition to the authenticity of this record, (prepared almost on the spot, by so competent a hand), it is drawn up with a raciness and vigour which imparts to the reader's mind an excitement not to be awakened by any cause, short of truth, breathed forth with the vivid energy of enthusiasm.

Narrative of the discovery and exhumation of the skeleton of the Mastodon; by REMBRANDT PEALE.

In the spring of 1801, receiving information from a scientific correspondent in the state of New York, that in the autumn of 1799 many bones of the MAMMOTH had been found in digging a marle-pit in the vicinity of Newburgh, which is sit-

uated on the river Hudson, sixty-seven miles from the city of New York, my father, Charles Wilson Peale, immediately proceeded to the spot, and through the politeness of Dr. Graham, whose residence on the banks of the Wall-kill enabled him to be present when most of the bones were dug up, received every information with respect to what had been done, and the most probable means of future success. The bones that had been found were then in the possession of the farmer who discovered them, heaped on the floor of his garret or granary, where they were occasionally visited by the curious.—These my father was fortunate to make a purchase of,* together with the right of digging for the remainder, and, immediately packing them up, sent them on to Philadelphia. But as the farmer's fields were then in grain, the enterprise of further investigation was postponed for a short time.

The whole of this part of the country abounding with morasses, solid enough for cattle to walk over, containing peat, or turf and shell-marle, it is the custom of the farmers to assist each other, in order to obtain a quantity of the marle for manure. Pits are dug generally twelve feet long and five feet wide at the top, lessening to three feet at the bottom. The peat or turf is thrown on lands not immediately in use; and the marle, after mellowing through the winter, is in the spring scattered over the cultivated fields; the most luxuriant crops are the consequence. It was in digging one of these, on the farm of John Masten, that one of the men, thrusting his spade deeper than usual, struck what he supposed to be a log of wood, but on cutting it to ascertain the kind, to his astonishment, he found it was a bone; it was quickly cleared from the surrounding earth, and proved to be that of the thigh, three feet nine inches in length, and eighteen inches in circumference, in the smallest part. The search was continued, and the same evening several other bones were discovered. The fame of it soon spread through the neighbourhood, and excited a general interest in the pursuit! all were eager, at the expense of some exertions, to gratify their curiosity in seeing the ruins of an animal so gigantic, of whose bones very few among them had ever heard,

* They consisted of all the neck, most of the vertebræ of the back, and some of the tail; most of the ribs, in greater part broken; both scapulæ; both humeri, with the radii and ulnæ; one femur; a tibia of one leg, and a fibula of the other; some large fragments of the head; many of the fore and hind feet bones; the pelvis, somewhat broken; and a large fragment, five feet long, of one tusk, about mid-way. He therefore was in want of some of the back and tail bones, some of the ribs, the under jaw, one whole tusk and part of the other, the breast bone, one thigh, and a tibia and fibula, and many of the feet bones.

and over which they had so often unconsciously trod. For the two succeeding days upwards of an hundred men were actively engaged, encouraged by several gentlemen, chiefly physicians, of the neighbourhood, and success the most sanguine attended their labours: but, unfortunately, the habits of the men, requiring the use of spirits, it was afforded them in too great profusion, and they quickly became so impatient and unruly, that they had nearly destroyed the skeleton; and, in one or two instances, using oxen and chains to drag them from the clay and marle, the head, hips, and tusks were much broken; some parts being drawn out, and others left behind. So great a quantity of water, from copious springs, bursting from the bottom, rose upon the men, that it required several score of hands to lade it out, with all the milk-pails, buckets and bowls they could collect in the neighbourhood. All their ingenuity was exerted to conquer difficulties that every hour increased upon their hands; they even made and sunk a large coffer-dam, and within it found many valuable small bones. The fourth day so much water had risen in the pit, that they had not courage to attack it again. In this state we found it in 1801.

It was a curious circumstance attending the purchase of these bones, that the sum which was paid for them was little more than one-third of what had been offered to the farmer for them by another, and refused, not long before. This anecdote may not be uninteresting to the moralist, and I shall explain it. The farmer, of German extraction,—and like many others in America, speaking the language of his fathers better than that of his country—was born on his farm; he was brought up to it as a business, and it continued to be his pleasure in old age; not because it was likely to free him from labour, but because profit, and the prospect of profit, cheered him in it, until the end was forgotten in the means.—Intent upon manuring his lands to increase its production (always laudable), he felt no interest in the fossil-shells contained in his morass; and had it not been for the men who dug with him, and those whose casual attention was arrested, or who were drawn by report to the spot, for him the bones might have rotted in the hole in which he discovered them; this he confessed to me would have been his conduct, certain that after the surprise of the moment they were good for nothing but to rot as manure. But the learned physician, the reverend divine, to whom he had been accustomed to look upwards, gave importance to the objects which excited the vulgar stare of his more inquisitive neighbours: he therefore joined his exertions to theirs, to recover as many of the bones as possible. With him, hope was every thing; with the men, curiosity did much, but rum did

more, and some little was owing to certain prospects which they had of sharing in the future possible profit. It is possible he might have encouraged this idea; his fear of it, however, seems to have given him some uneasiness; for when he was offered a small sum for the bones, it appeared too little to divide: and when a larger sum, he felt would have engrossed the whole of it, or persuade himself that the real value might be something greater. Ignorant of what had been offered him, my father's application was in a critical moment, and the farmer accepted his price, on condition that he should receive a new gun for his son, and new gowns for his wife and daughters, with some other articles of the same class. The farmer was glad they were out of his granary, and that they were in a few days to be two hundred miles distant; and my father was no less pleased with the consciousness, and on which every one complimented him, that they were in the hands of one who would spare no exertions to make the best use of them. The neighbours who had assisted the farmer in this discovery, envious of his good fortune, sued him for a share in the profit; but they gained nothing more than a dividend of the costs; it appearing that they had been satisfied with the gratification of their curiosity, and the quality and quantity of the rum; no one could prove that he had given them reason to hope for a share in the price of any thing his land might happen to produce.

Not willing to lose the advantage of an uncommonly dry season, when the springs in the morass were low, we proceeded on the arduous enterprise. In New-York every article was provided which might be necessary in surmounting expected difficulties; such as a pump, ropes, pulleys, augers, &c.; boards and planks were provided in the neighbourhood, and timber was in sufficient plenty on the spot.

Confident that nothing could be done without having a perfect command of the water, the first idea was to drain it by a ditch; but the necessary distance of perhaps half a mile, presented a length of labour that appeared immense. It was therefore resolved to throw the water into a natural basin, about sixty feet distant, the upper edge of which was about ten feet above the level of the water. An ingenious millwright constructed the machinery, and, after a week of close labour, completed a large scaffolding and a wheel twenty feet diameter, wide enough for three or four men to walk abreast in: a rope round this turned a small spindle, which worked a chain of buckets regulated by a floating cylinder; the water, thus raised, was emptied into a trough, which conveyed it to the basin; a ship's pump assisted, and, towards the latter part of

the operation, a pair of half barrels, in removing the mud. This machine worked so powerfully, that in the second day the water was lowered so much as to enable them to dig, and and in a few hours they were rewarded with several small bones.

The road which passed through this farm was a highway, and the attention of every traveller was arrested by the coaches, wagons, chaises, and horses which animated the road, or were collected at the entrance of the field: rich and poor, men, women and children, all flocked to see the operation; and a swamp always noted as the solitary abode of snakes and frogs, became the active scene of curiosity and bustle: most of the spectators were astonished at the purpose which could prompt such vigorous and expensive exertions, in a manner so unprecedented, and so foreign to the pursuits for which they were noted. But the amusement was not wholly on their side; and the variety of company not only amused us, but tended to encourage the workmen, each of whom, before so many spectators, was ambitious of signalizing himself by the number of his discoveries.

For several weeks no exertions were spared, and the most unremitting were required to insure success; bank after bank fell in; the increase of water was a constant impediment, the extreme coldness of which benumbed the workmen. Each day required some new expedient, and the carpenter was always making additions to the machinery; every day bones and pieces of bones were found between six and seven feet deep, but none of the most important ones. But the greatest obstacle to the search was occasioned by the shell marle which formed the lower stratum; this, rendered thin by the springs at the bottom, was, by the weight of the whole morass, always pressed upwards on the workmen to a certain height, which, without an incalculable expense, it was impossible to prevent. Twenty-five hands at high wages were almost constantly employed, at work which was so uncomfortable and severe, that nothing but their anxiety to see the head, and particularly the under jaw, could have kept up their resolution. The patience of employer and workmen was at length exhausted, and the work relinquished without obtaining those interesting parts, the want of which rendered it impossible to form a complete skeleton.

It would not have been a very difficult matter to put these bones together, and they would have presented the general appearance of the skeleton; but the under jaw was broken to pieces in the first attempt to get out the bones, and nothing but the teeth and a few fragments of it were now found; the

tail was mostly wanting, and some toe-bones. It was, therefore, a desirable object not only to procure some knowledge of these deficient parts, but if possible to find some other skeleton in such order as to see the position, and correctly to ascertain the number of the bones. In the course of eighteen years there had been found within twelve miles of this spot, a bone or two in several different places; concerning these we made particular inquiries, but found that most of the morasses had been since drained, and consequently either the bones had been exposed to a certain decay, or else so deep, that a fortune might have been spent in the fruitless pursuit. But through the polite attention of *Dr. Galatan*, we were induced to examine a small morass, eleven miles distant from the former, belonging to Capt. J. Barber, where, eight years before, four ribs had been found in digging a pit. From the description which was given of their position, and the appearance of the morass, we began our operations with all the vigour a certainty of success could inspire. Nearly a week was consumed in making a ditch, by which all the water was carried off, except what a hand-pump could occasionally empty: the digging, therefore, was less difficult than at Masten's, though still tedious and unpleasant; particularly as the sun, unclouded as it had been for seven weeks, poured its scorching rays on the morass, so circumscribed by trees, that the western breeze afforded no refreshment; yet nothing could exceed the ardour of the men, particularly of one, a gigantic and athletic negro, who exulted in choosing the most laborious tasks, although he seemed melting with the heat. Almost an entire set of ribs were found, lying nearly together, and very entire; but as none of the back bones were found near them (a sufficient proof of their having been scattered) our latitude for search was extended to very uncertain limits; therefore, after working about two weeks, and finding nothing belonging to the head but two rotten tusks, (part of one of them is with the skeleton here) three or four small grinders, a few vertebræ of the back and tail, a broken scapula, some toe-bones, and the ribs, found between four and seven feet deep, a reluctant terminating pause ensued.

These bones were kept distinct from those found at Masten's as it would not be proper to incorporate into one skeleton any other than the bones belonging to it; and nothing more was intended than to collate the corresponding parts. These bones were chiefly valuable as specimens of the individual parts; but no bones were found among them which were deficient in the former collection, and therefore our chief object was defeated. To have failed in so small a morass was rather discouraging to the idea of making another attempt; and yet the

smallness of the morass was, perhaps, the cause of our failure, as it was extremely probable the bones we could not find were long since decayed, from being situated on the rising slope at no considerable depth, unprotected by the shell-marle, which lay only in the lower part of the basin forming the morass.—When every exertion was given over, we could not but look at the surrounding unexplored parts with some concern, uncertain how near we might have been to the discovery of all that we wanted, and regretting the probability that, in consequence of the drain we had made, a few years would wholly destroy the venerable objects of our research.

Almost in despair at our failure in the last place, where so much was expected, it was with very little spirit we mounted our horses, on another inquiry. Crossing the Wall-kill at the falls, we ascended over a double swelling hill into a rudely cultivated country, about twenty miles west from the Hudson, where, in a thinly settled neighbourhood, lived the honest farmer Peter Millspaw, who, three years before, had discovered several bones: from his log-hut he accompanied us to the morass.—It was impossible to resist the solemnity of the approach to this venerable spot, which was surrounded by a fence of safety to the cattle without. Here we fastened our horses, and followed our guide into the centre of the morass, or rather marshy forest, where every step was taken on rotten timber and the spreading roots of tall trees, the luxuriant growth of a few years, half of which were tottering over our heads.—Breathless silence had here taken her reign amid unhealthy fogs, and nothing was heard but the fearful crash of some mouldering branch or towering beach. It was almost a dead level, and the holes dug for the purpose of obtaining manure, out of which a few bones had been taken six or seven years before, were full of water, and connected with others containing a vast quantity; so that to empty one was to empty them all; yet a last effort might be crowned with success; and, since so many difficulties *had been* conquered, it was resolved to embrace the only opportunity that now offered for any farther discovery. Machinery was accordingly erected, pumps and buckets were employed, and a long course of troughs conducted the water among the distant roots to a fall of a few inches, by which the men were enabled, unmolested, unless by the caving in of the banks, to dig on every side from the spot where the first discovery of the bones had been made.

Here alternate success and disappointment amused and fatigued us for a long while; until, with empty pockets, low spirits, and languid workmen, we were about to quit the morass with but a small collection, though in good preservation,

of ribs, toe and leg-bones, &c. In the meanwhile, to leave no means untried, the ground was searched in various directions with long-pointed rods and cross-handles : after some practice we were able to distinguish by feeling, whatever substances we touched harder than the soil ; and by this means, in a very unexpected direction, though not more than twenty feet from the first bones that were discovered, struck upon a large collection of bones, which were dug to and taken up, with every possible care. They proved to be a humerus, or large bone of the right leg, with the radius and ulna of the left, the right scapula, the atlas, several toe-bones, and the great object of our pursuit, a complete UNDER JAW !

After such a variety of labour and length of fruitless expectation, this success was extremely grateful to all parties, and the unconscious woods echoed with repeated huzzas, which could not have been more animated if every tree had participated in the joy. "Gracious God, what a jaw ! how many animals have been crushed by it !" was the exclamation of all ; a fresh supply of grog went round, and the hearty fellows, covered with mud, continued the search with increasing vigour. The upper part of the head was found twelve feet distant, but so extremely rotten that we could only preserve the teeth and a few fragments. In its form it exactly resembled the head found at Masten's ; but, as that was much injured by rough usage, this, from its small depth beneath the surface, had the cranium so rotted away as only to show the form around the teeth, and thence extending to the condyles of the neck ; the rotten bone formed a black and greasy mould above that part which was still entire, yet so tender as to break to pieces on lifting it from its bed.

This collection was rendered still more complete by the addition of those formerly taken up and presented to us by Drs. Graham and Post. They were a rib, the sternum, a femur, tibia and fibula, and a patella or knee-pan. One of the ribs had found its way into an obscure farm-house, ten miles distant, to which we fortunately traced it.

Thus terminated this strange and laborious campaign of three months, during which we were wonderfully favoured, although vegetation suffered, by the driest season which had occurred within eight years. Our venerable relics were carefully packed up in distinct cases ; and, loading two wagons with them, we bade adieu to the vallies and stupendous mountains of Shawangunk : so called by their former inhabitants, the Indians of the Lenape tribe. The three sets of bones were kept distinct : with the two collections which were most numerous it was intended to form two skeletons, by still keeping

them separate and filling up the deficiencies in each by artificial imitations from the other, and from counterparts in themselves. For instance, in order to complete the first skeleton, which was found at Masten's, the under jaw was to be modelled from this, which is the only entire one that has yet been discovered, although we have seen considerable fragments of at least ten different jaws : while, on the other hand, in the skeleton just discovered at Barber's, the upper jaw, which was found in the extreme of decay, was to be completed, so far as it goes, from the more solid fragment of the head belonging to the skeleton found at Masten's. Several feet-bones in this skeleton were to be made from that ; and a few in that were to be made from this. In this the right humerus being real, the imitation for the left one could be made with the utmost certainty ; and the radius and ulna of the left leg being real, those on the right side would follow, of course, &c. The collection of ribs in both cases was almost entire ; therefore, having discovered from a correspondence between the number of vertebræ and ribs in both animals, that there were nineteen pair of the latter, it was necessary in only four or five instances to supply the counterparts, by correct models from the real bones. In this manner the two skeletons were formed, and are in both instances composed of the appropriate bones of the animal, or exact imitations from the real bones in the same skeleton, or from those of the same proportion in the other. Nothing in either skeleton is imaginary ; and what we have not unquestionable authority for, we leave deficient ; which happens in only two instances, the *summit* of the head, and the *end* of the tail.

We now proceed to describe the parts composing the skeleton of the mastodon, and give in detail the measurements we have very carefully made on the excellent specimen in the Philadelphia Museum. To naturalists this will be the more acceptable as it has not heretofore been done throughout ; and it will enable the general reader to form more definite conclusions relative to the animal, by furnishing positive data for the basis of an accurate comparison between the bones of this skeleton and those belonging to other large quadrupeds.

The Skull.—The upper parts of the skull are entirely lost, as already stated, down to the level of the anterior part of the zygomatic arch, except at the back of the skull, where the occipital bone rises above the level stated, and is eleven inches and a quarter high. The lower halves (or rather more) of the intermaxillary bones, and nearly the whole of the superior maxillary and cheek bones, are also preserved. The zygoma-

tic arches are complete, and the junction between the jugal process of the temporal and that of the molar bone is very strong, the process of the temporal bone forming little more than one-third of the arch.

The posterior part of the skull is the broadest portion, being thirty-two inches across. When the skull is placed on the ground inverted, and we look upon its inferior surface, (as exhibited in Mr. LACETEK's very accurate drawing) from the extreme points of this widest part of the head, the outlines of the sides of the skull speedily converge so as to run within the zygomatic arches; and continue to become narrower until traced to the posterior surface of the facial bases of the zygomatic arch, where the skull is narrowest. The outline formed by the external surface of the zygomatic arches, from the origin to the angles of the occipital bone, give the whole inferior and posterior surface of the skull a peculiarly square form. All the parts of the skull are exceedingly massive and hard, appearing to have undergone very little change.

The intermaxillary, or incisive bones, are nearly entire in their inferior portions, and on the left side were most perfect; the part forming the sockets for the tusk measures thirteen inches and a half in circumference, beginning opposite to the ante-orbital foramen, and extending to a line contiguous with the centre of the palate.

The maxillary, or upper jaw-bones, are entire, and the palate plate remarkably strong and compact in texture. The alveolar processes are situated very near the outer edge, and rise very slightly above the plane of the roof of the mouth, and diverge considerably from the posterior to the anterior part of the range. Hence, at the back of the mouth the distance from the inside of the last molar to the same place on the opposite side, is six inches and one-eighth, while from the inside of the first molar to the correspondent tooth on the other side the space is eight inches. Immediately in front of the first molar, measuring from the external edge of its alveolar process to the same on the opposite side, the width of the palate plate is fifteen inches and four-eighths. Behind the last molar, and midway to the pterygoid processes of the sphenoid, the palate-bone is seven and a half inches wide. The length of the pterygoid process, to the base of the skull, is seven inches.

The molar, or cheek bones, forming the prominences at the superior and external part of the face, are nearly entire. From the edge of the infra, or ante-orbital foramen, to the zygomatic or temporal fossa, its width is five inches and an eighth; its height, measured within the fossa, is eight; its greatest breadth externally is six inches, and the narrowest portion of its zyg-

matic process three-quarters of an inch. Its length, from the foramen to the extremity of the zygomatic process, is seventeen inches and seven-eighths.

The temporal bone is entire, except in its thin superior portion. The length of its zygomatic process is seven and a half inches. The distance of the auditory foramen, from the cavity for the articulation of the lower jaw, is one inch. The cavity for the reception of the condyles of the lower jaw is one inch and seven eighths, measured through the centre transversely.

The occipital bone is remarkably square on its posterior surface, which is thirty-two-inches broad, and eleven inches and a quarter high. How much higher the bones ascended cannot now be determined. The distance between the posterior extremities of the occipital condyles is two inches and one-sixteenth; the breadth of the condyle is three inches and one eighth. The foramen magnum (for the exit of the spinal marrow) is two and a half inches in diameter.

The first vertebræ of the neck, or atlas, receiving the condyles of the occipital bone, is eleven inches broad. Its length from the tip of one transverse process to the other is eighteen inches.

The most remarkable peculiarities of the mastodon skull are summed up by CUVIER in the following manner:*

1st. The molars of the mastodon *diverge* in front, while those of the living elephant converge, more or less, and those of the fossil elephant (the true mammoth of Siberia) are nearly parallel. The hog and hippopotamus are the only animals which, in this respect, resemble our animal.

2d. The bony palate extends far beyond the last tooth; among herbivorous animals the Ethiopian boar (*Phacochærus*) alone possesses this character.

3d. The pterygoid apophysis of the palate bones have a size unexampled among quadrupeds.

4th. The depression anterior to this apophysis has some relation with that of the hippopotamus, which, however, is straighter.

5th. There is no visible trace of the orbit at the anterior part of the zygomatic arch, whence the eye must have been much higher than in the elephant.

6th. The maxillary bones have much less vertical elevation than in the elephant, and resemble ordinary animals more strongly.

7th. The zygomatic arch, for the same reason, is much less

* See R. FRALE's Disquisition, heretofore cited.

curved in front, which corresponds with the form of the lower jaw. The position of the ear depends on that of this arch.

5th. This position has much influence on the position of the occipital condyles, which are in the elephant, considerably elevated above the level of the palate; in the mastodon they are nearly on the same level.

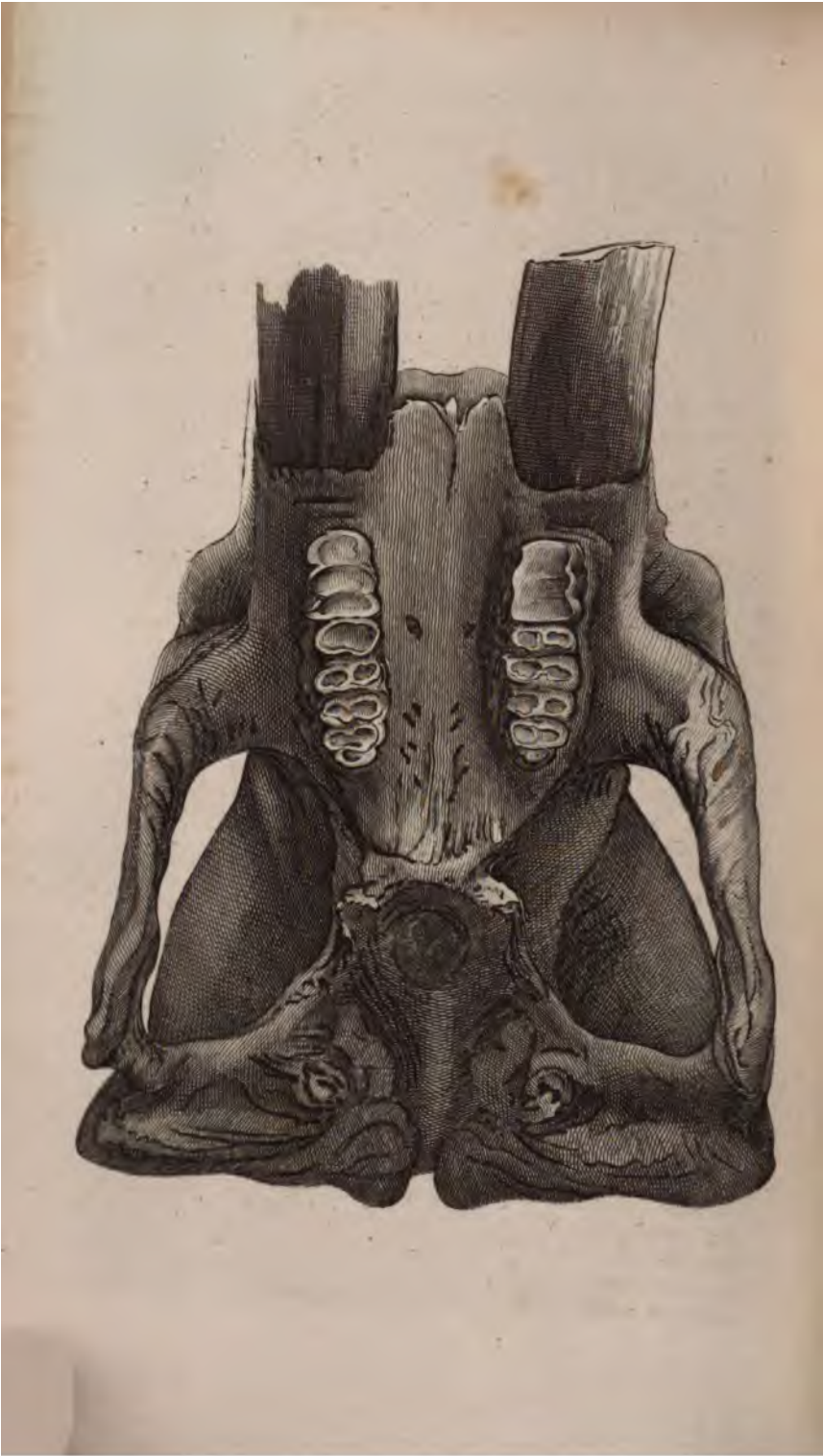
The Tusks.—As the bones of various other animals were discovered in the same place where the first tusks of this animal were found, some doubt was entertained of their belonging to the same skeleton which contained the tuberculated minor teeth. Dr. W. HURTER stated in the *Philosophical Transactions*, his belief that they pertained to the same animal. But all doubts were dispersed by the discovery of the great skeleton obtained in New York by Messrs. PEARL, which was entirely same, or separated from the bones of all other quadrupeds.

The tusks of the mastodon bear a considerable resemblance to those of the elephant, but present some appearances different from those observed in the generality of tusks of that animal; though these are by no means greater than may be found in different individuals of that genus.

These tusks are rooted in the intermaxillary bones, the sockets being eight inches in depth. The tusk belonging to the skeleton we are describing is ten feet seven inches long, measuring from the base to the tip, following the outside of the curvature: the point is not exactly in the same plane with the base, owing to the peculiar spiral twist of the anterior portion of the tusk. The direction of the tusk in leaving the socket is rather more oblique in front than in the elephant. The diameter of the tusks at base is seven inches and three-quarters; in the middle their substance is very similar to that of the elephant tusk, composed of an ivory, the grain of which is arranged in curvilinear lamellæ. The external part of the tusk is hard, and differs considerably in appearance from common ivory; the internal is of the texture of ivory, but is of much softer consistence.

R. PEARL dwells with much force on these circumstances, as well as on the roundness and peculiar curve of the mastodon tusk, in forming his conclusions relative to their position in the head, (which he believed to be with the convexity forwards, and the point turning downwards and backward) as well as in deciding on the mode of living of the animal. CUVIER has, however, satisfactorily shown that the differences are neither so uniform nor so remarkable as was believed, and that the difference in consistence of the ivory is accidental, or attributable to the circumstances under which these remains,





during so great a lapse of time, were situated. As an immediate consequence of the great similarity existing between the skeletons and tusks of the elephant and mastodon, we form the inference that they were as *analogous* in their modes of living as in their conformation.

The tusks of our animal were placed with their convexity in front, and their points curving downwards and backwards, in the specimen mounted in the Philadelphia Museum. This position is certainly unnatural, as CUVIER has clearly shown, by reference to the length of limb of this animal, the impossibility of its using the tusks, thus arranged; and from the fact that the Siberian mammoth (elephant) has tusks equally curved, and their points unequivocally turned upwards.

The morse, which has tusks pointing downwards, (see vol. i. p. 351) is an animal possessing very short limbs, and destined to an aquatic life. A conclusion drawn from the tusks of this animal is inapplicable, since we must believe the mastodon (like the elephant) to have been a terrestrial animal.—Nothing therefore can justify us in placing these tusks otherwise than in the elephant, unless we find a skull which has them actually implanted in a different manner.*

The Under Jaw of the mastodon is remarkable for its massiveness and solidity, and the form of it is peculiar to this animal. It is two feet ten inches long, and weighs sixty-three and a half pounds. The anterior part or chin is inclined so as to terminate conically, being marked by numerous rough prominences; where the two sides of the jaw unite in front, there is an intervening furrow or depression. The outline of the lower jaw is formed by three lines touching each other so as to form three different angles; the first extends from the top of the condyloid process for twelve inches towards the angle of the jaw:—the second, commencing at this point and terminating in a protuberance, which is at the inferior and anterior part of the angle, and the third passing thence almost horizontally, terminates with the anterior extremity of the jaw.

The condyloid or articulating surfaces are five and a half inches wide, and stand on very strong processes; the coronoid processes for the insertion of the temporal muscles are nearly on a level with the condyles, and are separated from them by a semilunar notch, six and a quarter inches in width. The general figure of the lower jaw, at the posterior part extending forwards to the base of the coronoid process, bears considerable resemblance to the same parts in the human jaw.

* See Cuvier; Oss. Foss. tom. ii.

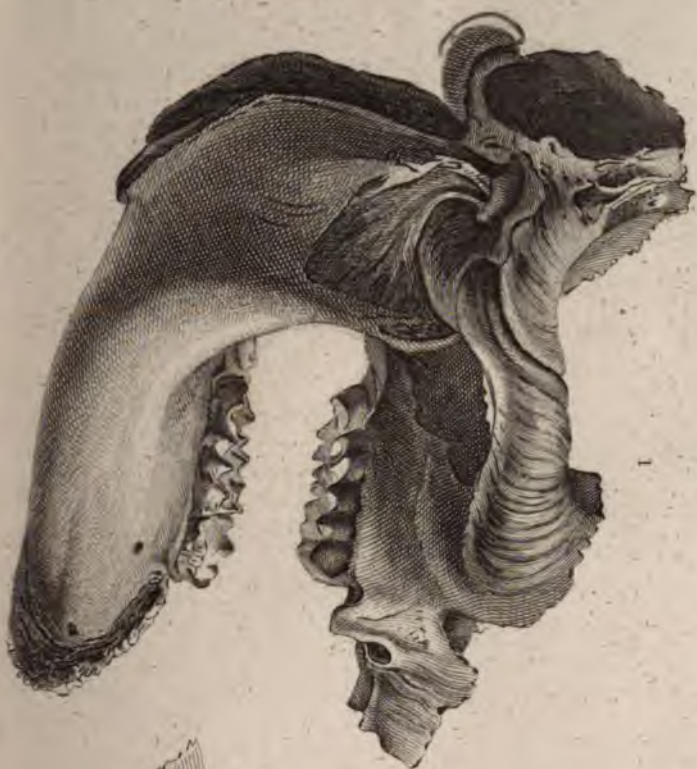
The teeth in the lower jaw are arranged so as to be very nearly parallel to those in the upper jaw, and the two ranges are most widely separate at the fore part. They are not disposed parallel to the direction of the sides of the jaw, but diagonally, from the inner to the outer part. Thus these teeth do not meet the superior teeth fully crown to crown, but obliquely crossing each other, the lower teeth being worn most at the anterior part and on the outside, while the superior teeth are most worn on the inside and fore part of the mouth, as shown in the plate, figure 2.

From the size of the head, the thickness and solidity of the teeth, and the enormous magnitude of the tusks, we can at once perceive that the neck of the animal must of necessity have been short, in order to sustain so great a weight. These circumstances, considered in connexion with the length of the limbs, presently to be described, clearly indicate that the mastodon, like the elephant, had a long and flexible trunk for the purpose of conveying its aliment to the mouth; the shortness of the neck, and the projection and curvature of the tusks, would equally have prevented the approach of the mouth to the ground.

Bones of the Trunk.—The bones of the neck are similar in character to those of the elephant, and thus far support the opinion drawn from the preceding circumstances. According to the observation of R. PEALE the spinous processes of the three last vertebræ of the neck are not so long in the elephant.

The spinous processes of the second, third and fourth dorsal vertebræ are exceedingly long. The longest of them measures eighteen or twenty inches, the whole length of the vertebræ being twenty-seven. The spinous processes of the back then rapidly diminish to the twelfth, and become so small as scarcely to be remarked, thence to the sacrum. This conformation, as Mr. PEALE has well pointed out, differs remarkably from that of the elephant, in which the processes are more uniform in their length:—those over the shoulders being shorter, and those of the back and loins much longer; hence the form of the back in the elephant is more arched. There are seventeen cervical, nineteen dorsal, and three lumbar vertebræ. CUVIER remarks that the elephant has one more dorsal vertebræ, and one more pair of ribs; but suggests that the corresponding parts in the mastodon have been destroyed.

The ribs are not similar to those of the elephant, small near the head, broad as they approach the cartilage, and bent side-wise in an undulating manner; but they are slender near the cartilage, and thick and strong towards the back. The difference is peculiarly observable in the first rib. The six first



Calamagrostis Del.

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1. 1000

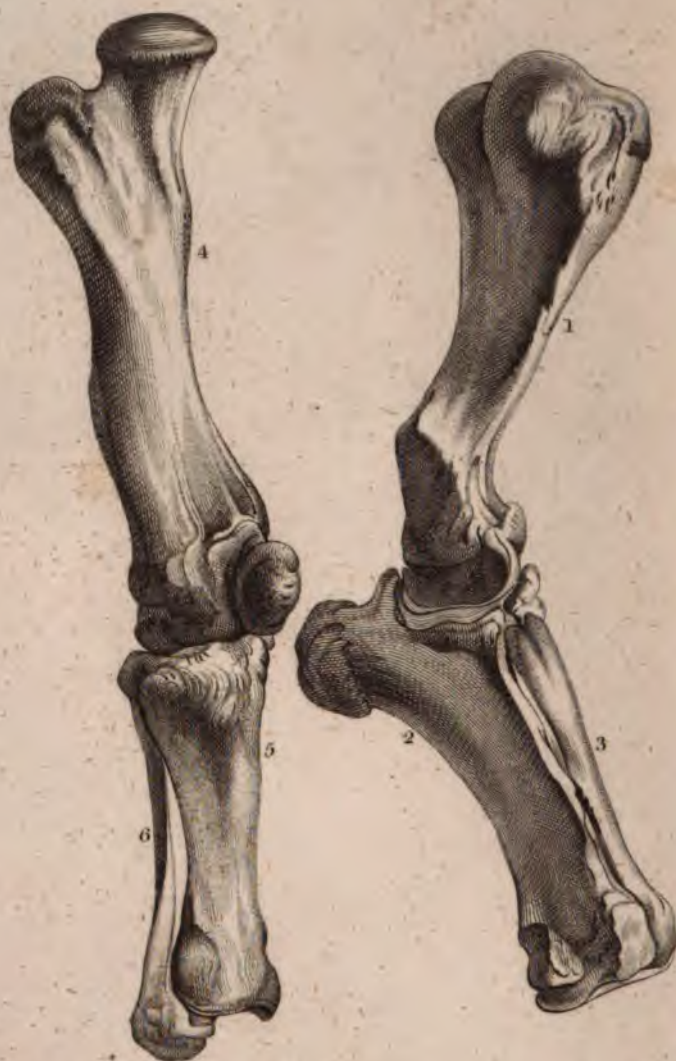












MASTODON

1. *Humerus*
2. *Ulna*
3. *Radius*

4. *Femur*
5. *Tibia*
6. *Fibula*

pairs are remarkably strong, when compared with the remainder, which are proportionally short. This, joined to the flatness of the pelvis, shows the belly to have been less in the mastodon than in the elephant.

Scapula, or Shoulder-blade.—This bone has the characters peculiar to that belonging to the elephant; particularly the recurrent process, which is only found in the elephant and some of the gnawing animals. The length of the whole bone is thirty-seven inches. The acromion process is very long and pointed.

Arm, Forearm, &c.—The arm bone, or *humerus*, is very thick, and in proportion, much thicker than the thigh bone; this difference, in proportion, is much more remarkable than in the elephant.* In length the humerus is two feet ten inches; its greatest circumference is three feet two inches and a half, and its smallest part measures one foot five inches around.

The *ulna* is proportionally as massive as the humerus, and the olecranon (process forming the point of the elbow) is strong and knobbed at the end, being eight inches and a quarter in circumference at base. The ulna is two feet five inches and a half long, while its circumference around the elbow is three feet eight inches.

The *radius* is a comparatively small bone, two feet four inches long, and is placed in such a manner as to cross obliquely from the outside above to the inside below, forming thus a greater angle than if the bones were slender, in which case the crossing would be scarcely observable; perhaps it is more remarkable in the mammoth than in any other animal.† Its carpal articulating surface is four inches and five-eighths broad.

The bones of the *carpus*, in the skeleton belonging to the Philadelphia Museum, are seven in number; the forms of those in the first now generally agree with those of the elephant, as figured by CUVIER.‡ The external face of those belonging to the second row appear to differ by being proportionally larger and squarer than in the elephant. The metacarpal bones are strong and massive; their surfaces for articulation with the digital phalanges are extensive, and indicate that the toes were capable of very considerable flexion. The metacarpal of the first digit, or thumb, is two inches and a quarter in length, of the second digit three inches; of the third and fourth four

* PEALE, Hist. Disquis. 8vo. 56.

† PEALE, Hist. Disquis. 4to. 56.

‡ Ossements Fossiles, vol. ii. ed. 1.

inches and a half; and of the fifth external, or smallest, three inches.

The Pelvis.—This part of the skeleton has sustained a considerable degree of injury. The iliac or haunch bones at their superior parts being in a great degree lost. Still the quantity of sound bone remaining is quite sufficient to show the general form and dimensions of this part of the animal. On the left side the bone is uninjured, except along the border, from above the anterior superior spine. The width of the pelvis, measuring from this spine to the edge of the pubis at the symphysis, is two feet eleven inches, which gives a total breadth of the pelvis of five feet ten inches, without allowing for the cartilage, which must, in the living condition, have intervened at the pubic and sacro iliac symphyses. The pubis, from the anterior to the posterior edge, is six inches in extent. The longest diameter of the foramen thyroideum is eight inches; the transverse diameter five inches.

We were led to make this measurement of the pelvis with the greater care, because CUVIER makes the following remarks on the subject of its width:—"Mr. PEALE states that the width of the pelvis of his skeleton is five feet eight inches (Engl.), but I fear that this is a typographical error, or that he meant it for the measure of the circumference."^{*}

The difference between the measurement of the pelvis stated by R. PEALE, and that given by us, is owing to the circumstance of our having measured different skeletons. His measurements were made on the skeleton now in Baltimore; ours were carefully taken from that in the Philadelphia Museum.

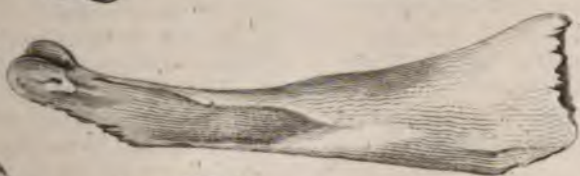
It was first stated by R. PEALE, and subsequently confirmed by CUVIER, that these bones are more depressed than in the elephant. This indicates, says this zoologist, that the belly must have been smaller, and consequently the intestines less voluminous than in the elephant; this, together with the structure of its teeth, concurs in causing the mastodon to be regarded as less exclusively herbivorous than from other circumstances is commonly inferred.

The Femur, or Thigh-Bone.—This bone is perfectly preserved, and is a fit column for the support of so large a superstructure. It is three feet seven inches long and eight inches in diameter at the middle of its shaft; the whole of the middle part of the bone is peculiarly flattened. The neck of this thigh-bone, which is six inches and three-fourths in diameter on a level with the top of the trochanter, is a very strong process, and is surmounted by a head seven inches in diameter.

^{*} Oss. Foss. tom. 2.



S. Scapula.



1^{re} rib.



Thorax und Abdomen.



Carpus und Metacarpus.



The great or external trochanter, projecting below and opposite the neck of the bone, is a strong and massive process, having a large depression at its basis on the posterior surface of the bone. The lesser or internal trochanter does not exist, except as a slightly extended roughness on the inner edge of the bone. The transverse diameter of the articulating surfaces or condyles of the femur is nine inches and five-eighths; of each condyle, four inches and a half.

The Tibia and Fibula, or Leg-Bones.—The tibia is two feet long, and in strength and solidity is well proportioned to the femur; it is ten inches broad at its superior portion, and seven inches and seven-eighths at the inferior part. Its diameter in the middle is four inches and five-eighths.

The fibula is comparatively slight and slender, and occupies the same relative position in the mastodon as in the human subject. Its superior extremity is closely united to the superior and posterior part of the tibia; its inferior extremity passes below that of the tibia for three inches and a half, constituting the support of the outer part of the ankle joint. The whole length of the bone is twenty-six inches.

The bones of the *tarsus* are very analogous to the same bones in the elephant, but appear flatter and thinner in proportion. The articulating surface of the astragalus is remarkably flat, and is five inches broad from the anterior to the posterior edge; the thickness of the bone, measured on the anterior surface, is two inches and three-quarters. The os calcis, measured on its inferior surface, is six inches long, and is a very large and strong bone. Its surface for articulation with the extremity of the fibula, is four inches and a half in length, from its anterior to the posterior edge. The os naviculare is five inches long; its breadth in the middle is one inch and three-quarters. The internal cuneiform bone sustains the metatarsal of the internal or first toe; the middle and external cuneiform sustain a part of the second and medial metatarsal bones, while the cuboid receives both the external, or the fourth, and little toe. The length of the first metatarsal is three inches; of the second, three and three-fourths; of the third, five; of the fourth, four and a half; of the fifth, four.

Localities whence Mastodon bones have been obtained in greatest abundance.

Among the earliest localities discovered, was Big-bone Lick, in Kentucky, which derived its name from the great number of fossil bones there found. This celebrated lick is a

of one of those huge animals, best known in the United States by the name of the mammoth. The contents of the viscus were carefully examined, and were found to be 'in a state of perfect preservation.' They consisted of half-masticated reeds, (a species of *Arundo* or *Arundinaria*, still common in Virginia and other parts of the United States,) of twigs of trees, and of grass or leaves.*

The best comment that can be offered on this discovery is the original letter of the learned and excellent Bishop MADISON, from which it will appear that he never saw the *place* nor the *thing* which was supposed to be the *stomach*, neither is the evidence given with sufficient conclusiveness to establish *any opinion* on the subject. We take the liberty of proving this by italicising some parts of the bishop's letter :

"One of those facts has lately occurred, which the naturalist knows best how to appreciate, and which I, therefore, take a pleasure in communicating to you. It is now no longer a question whether the mammoth was a herbivorous or carnivorous animal. Human industry has revealed a secret, which the bosom of the earth had, in vain, attempted to conceal. In digging a well near a salt-lick, in Wythe county, Virginia, after penetrating about five feet and a half from the surface, the labourers struck upon *the stomach of a Mammoth*. The contents were in a state of *perfect preservation*, consisting of half-masticated reeds, twigs, and grass, or leaves. *There could be no deception* ; the *substances* were designated by *obvious characters*, which *could not be mistaken*, and of which *every one* could judge ; besides, the *bones of the animal lay around*, and added a silent, but sure confirmation. The whole rested upon a lime-stone rock. *I have not seen, as yet, any part of those contents* ; for, *though I was within two days' journey of the place where they were found, I was so well satisfied with the narration of gentlemen who had seen them, and upon whose veracity, as well as accuracy, I could rely, that I thought the journey UNNECESSARY* ; especially as I took measures to ensure the transmission of a sufficient quantity of the contents, together with all the bones to Williamsburgh.—When the contents arrive, a part shall be forwarded to you. I hope to form a complete skeleton of this vast animal, having given directions to spare no labour in digging up every bone.

[Then follows a sentence cited from Blumenbach, showing how the soft parts of animals may be preserved, after which the letter concludes in the following manner :]

* Barton's Med. and Phys. Journal, vol. iii. p. 23, of first supplement.

"Whether this first kind of petrification, of which Blumenbach speaks, and which he calls *simplement calcines* has been the cause of the preservation of these substances, or whether it be the effect of the marine salt, with which the earth, where they were buried, has been constantly charged, must be left to future investigation. I pretend not to decide. *Had they been buried deep in the earth*, that circumstance alone might have prevented decomposition; *but the depth of five or six feet* seems insufficient to arrest that chemical action, which changes the appearances of organized bodies. *The fact, however, is decisive, as to the principal question.* It has summoned the discordant opinions of philosophers *before a tribunal from which there is no appeal.*"*

Such is the letter of Bishop Madison; and thus the discovery remains at the present day. Dr. Barton's letter, first quoted, consists of little more than the same matter in other words. It is much to be regretted that the worthy prelate did not inspect this locality, and ascertain for himself, by scrutinizing all the collateral circumstances, whether this *stomach*, so confidently pronounced to be that of the mastodon, might not have belonged to some domestic animal, which had perished from disease, and been interred "at a depth of five or six feet," and by accident, in the immediate vicinity of mastodon bones.—Neither the dimensions, figure, nor peculiar nature of this stomach is described, nor do we know that it was such, except upon the hearsay evidence contained in the bishop's letter. Dr. Barton tells us of the specific nature of part of the matter, but does not say whether he had examined it himself or not, though it is probable he had received a specimen. We think but one opinion can be formed on the subject—whatever this *stomach* may have been, or whatever was the nature of its contents, its connexion with the bones of the mastodon was altogether *accidental*. It would be something very singular indeed, when the strongest animal fibres, the ligaments, tendons, muscles, &c. had all disappeared, that the stomach alone "at a depth of five or six feet," should escape almost uninjured!

In the year 1817 Professor MITCHELL, in company with Dr. PETER S. TOWNSEND and several other gentlemen, explored, a small meadow in the vicinity of Chester, near Goshen, in Orange county, New York. Ten years previously some bones had been disinterred at that place, and some of them still remained at the bottom of a ditch.

* Bishop Madison subsequently corrected the impression made by this letter, acknowledging that his information was inaccurate, and his conclusions too hastily adopted.

This ground has been successfully drained and converted into a meadow. The surface was covered by a fine grassy sward, beneath which was a soil composed of a bed of black peat turf, six feet in thickness. "The soil and sward were about four feet thick over the bones; beneath them, and immediately around them, was a stratum of coarse vegetable stems and films, resembling chopped straw, or rather drift stuff of the sea, for it seemed to be mixed with broken films of conferva, like those of the Atlantic shore."

As these bones were found in a peat-bog containing no marl, the bones were far more rotten than those obtained from the marl pits, by MESSRS. PEARL. It was impossible to extract them entire, and it was equally so to reunite the fragments after their exhumation. The bones discovered consisted of parts of the feet, legs, shoulder-blade, back-bone, rump, lower-jaw, upper-jaw, teeth, and tusks.

The teeth were uninjured, and more than half of the lower jaw was preserved; but the condyles and angles of the other side broke in pieces when handled. The upper jaw, with its teeth and tusks, were found retaining their natural connexions. When the mud was carefully removed from them, the palate bones and teeth were found to be uppermost, as if the animal had perished on its back. The tusks differed in size, length and curvature; the right one measured seven feet in length, and was thicker and blunter than the left, which was nearly nine feet long, more regularly tapered and pointed.

Dr. MITCHELL concludes his account of this interesting research, by stating that "the flatness of the cranium, the connexion of the tusks with the head by exertion and not by gomphosis, and the insertion of the grinders into them at their origin, will not fail to attract the attention of zoologists."*

These circumstances do not, however, appear to us very extraordinary, when taken in connexion with the facts previously stated. The bog was one containing no marl, or other antiseptic agent, and the soil covering these bones was a bed of black peat-turf, soaked in a large quantity of fluid. These bones were very rotten, and doubtless much decayed before the draining was begun. As the whole superincumbent soil settled, in consequence of the removal of the water, it appears highly probable that at the same time the water was withdrawn from the mud within the decayed skull, and the whole mass of decayed bone was flattened by the general pressure caused by

* Mitchell's Geological Appendix to Cuvier's Theory of the Earth, p. 379

the subsiding soil. Thus we would account for the appearances so faithfully noted in the above mentioned instance. In a recent conversation with Dr. TOWNSEND who aided professor MITCHILL on that occasion, and made accurate drawings of the bones as they were found, he expressed his entire belief in the probability of the explanation here given.

The *apparent* exertion of the tusks we would attribute to the entire destruction and removal of the inferior portions of their sockets, formed by the intermaxillary bones. To the causes above stated, we attribute the *apparent* insertion of the grinders into the roots of the tusks, producing the softening and subsequent compression of the alveolar processes, together with the approximation of all inferior and superior walls of the skull. We are fully convinced that these bones were in the relative positions so well described by MITCHILL. But that such was the relation of parts in the living animal, or in the sound skeleton, is forcibly denied by the two nearly entire skeletons of Philadelphia and Baltimore, as well as by fragments preserved in various cabinets of natural history.

In Rockland county, N. Y. eleven miles west of a spot where fragments of bones belonging to land animals were found imbedded in sand stone, by Dr. MITCHILL, at a distance of thirty-two miles from the city of New York, the remains of a mastodon were found in July 1817. They consisted of a set of grinders, which were accidentally discovered by a ditcher, in mud only three feet below the surface. They were large, having remarkably white and glossy surfaces; the roots were much decayed. Mr. EDWARD SUFFERN, Jun. who presented these teeth to professor MITCHILL, informed him that the cavities of these teeth contained a fatty substance when they were first discovered. This, however, had entirely disappeared before they were received by Dr. Mitchill.

In the year 1811, the remains of a mastodon of the species we have been describing was found on the banks of York river, about six miles east of Williamsburgh, in Virginia. They lay upon marsh-mud, or buried a few feet within it, and were surrounded by the roots of cyprus trees. The trees which these roots once supported had long been removed, and the difference between the level where the bones and roots are found and the top of the adjacent bank, is more than twenty feet. This locality was carefully examined by the Rev. Bishop MADISON, then president of William and Mary College, Va. who gave the details of the discovery to Dr. MITCHILL.* The

* See the Medical Repository, (N. Y.) xv. 388.

parts of the skeleton obtained were the pelvis bones, a thigh bone, two vertebræ, two ribs, nearly perfect, two tusks, not greatly injured, and seven molar teeth, four of which were in their sockets, apparently part of the lower jaw. The largest tooth weighed seven and a quarter, the smallest three to four pounds.

Various other localities have been mentioned, where bones of the mastodon and other large quadrupeds have been disinterred. At the Salines of Great Osage river they are said to be very abundant, as much so as at Bigbone Lick, or in the vicinity of the Wall-kill.* DARBY the geographer states in a letter to Dr. Mitchell, that while in Louisiana, in 1804, he visited Opelousas, within a few days after the exhumation of part of an under jaw and teeth of a mastodon.† We have been informed by our friend Dr. GRIFFIN, of Virginia, that the greater part of a skeleton of this animal was disinterred a few years since, in Bottetourt county, Va. These bones were in very good preservation.

There is every reason to believe that the bones of this gigantic animal, as well as the relics of various other extinct species, will be procured in great abundance as the internal improvement of our happy country advances. The magnificent works already completed have given no inconsiderable earnest of what may be expected from numerous others now in progress, and the means which are intended to facilitate the intercourse of our citizens, and bind them more firmly together by mutual interests, may also contribute in a powerful degree to shed light on some of the most obscure and interesting topics connected with the history of the globe. It should, therefore, be deeply impressed upon the minds of those who superintend the construction of canals, tunnels, roads, &c. that the fragments of organic remains which they might feel inclined to neglect as insignificant, may prove of the highest importance to science, when viewed in connexion with all the circumstances of their characters and positions, the peculiar nature of the superincumbent soil, and the general aspect of the surrounding country. When opportunities are presented, no pains should be spared, in order to procure bones, or other relics of animal bodies, with the least possible delay; and every attendant circumstance should be noted with the most scrupulous accuracy.

The last mastodon skeleton disinterred, was found in Monmouth county, New Jersey, three miles southwest of Long

* Vide Breckenridge's View of Louisiana.

† Mitchell's Geological Appendix.

branch. A grinder was presented by Mr. William Moore to the Lyceum of Natural History of New York, accompanied by information that the whole skeleton lay buried near the spot whence this tooth was obtained.*

This skeleton was accidentally discovered on Poplar farm, which is about two miles distant from the sea-beach, in 1823, fourteen months previous to the researches of Messrs. Cooper, Dekay and Van Rensselaer. The proprietor of the farm walking over a reclaimed marsh, observed something projecting through the turf, which he struck loose with his foot and found to be a grinder tooth. Two other teeth, some pieces of the skull, the spine, humeri, and other bones, were afterward exhumed.

The country adjacent to this farm is generally level, but a low and broad ridge, running parallel with the sea-coast, lies between it and the sea. At Poplar this high ground very gradually slopes on its western sides, now disencumbered of its forests, and intersected by ditches, so that at some seasons it is nearly dry. It is stated to have been watery at a former period, and abounded in a species of poplar, whence the place obtained its name. Near the border of this marsh there was a shallow cavity containing a little water; the left fore leg had been removed therefrom, and several broken vertebræ and fragments of other bones were scattered on the surrounding turf. Having obtained permission to make farther explorations, these zealous inquirers commenced operations, and during two days, with the aid of some gentlemen who accompanied them, succeeded in obtaining all the bones of this skeleton which remain undecomposed. This valuable collection was added to the cabinet of the Lyceum, previously enriched by the specimens obtained at Chester county in New York.

The following is the account given by these gentlemen of the position in which the animal appeared to have been placed at the time of its extinction, whatever may have been the catastrophe which destroyed the whole of its race :

The surrounding soil "was a stratum of what is, by the German geologists, called *geest*, that is, a black, soft, shining earth, abounding near the surface in vegetable roots and fibres. Before the time of our visit the skull, broken into many fragments, as well as the greater part of the spine, most of the ribs, both scapula, the left radius, ulna, and the humerus of the right

* See the Report of Messrs. Dekay, Van Rensselaer and Cooper, vol. i. p. 143 of the Annals of the Lyceum, whence this account is derived.

arm had been removed. Of the situation of these, therefore, we cannot speak from our own observation; but Mr. Croxson informed us, that, as before mentioned, part of the head had protruded itself through the surface of the ground. In consequence probably of this, it was so much decayed that he could find but three of the teeth, and no trace whatever of the tusks, nor was the search we afterward made for these latter more effectual. The vertebral column, with all its joints, and the ribs attached to them in their natural position, lay about eight or ten inches below the surface. The scapulæ rested upon the heads of the humeri, and these in a vertical position upon the bones of the fore arm, as in life. We found the right fore arm still buried. It inclined a little backwards, and the foot which was immediately below it, was placed a little in advance of the other, as it would be if the animal had been walking.

"At the depth of about ten inches, and immediately below the matting of turf which forms the surface of the meadow, we came to the sacrum, with the pelvis remaining united to it, though in a very decayed state. The femora lay adjoining, but, unlike the bones of the fore legs, in a position nearly horizontal, the right less so than the left, and both at right angles with the spine. These were also, from their proximity to the surface, much decayed, so that the left fell to pieces on being lifted from its bed. Both tibiæ, each with its fibula, stood nearly erect under the extremities of the femora, and under them the bones of both hind feet in their proper relative position. We found no caudal vertebræ. The marsh had been cleared and drained about three years, and during that period, as the proprietor informed us, the level of its surface had lowered about two feet. To this may have, perhaps, been owing the horizontal position of the thigh bones, which would naturally be forced out of their originally erect position by the pressure of the heavy superincumbent bed of turf.—The bones of the fore leg, however, do not appear to have been thus acted upon.

"The deeper we penetrated the sounder we found the bones, so that those of the foot, lying lowest, were obtained in a state of perfect preservation. The greater part of the bones had, adhering to their surface and in their cavities, the phosphats of iron and lime, and the sulphat of lime in very small quantities, the last in minute crystals. There were also considerable masses of oxyd of iron or bog-ore, which, however, abounded in various places in the marsh. Immediately underlying the stratum of black earth, we came to another of sand, having a ferruginous tinge, and containing numerous

rolled quartz pebbles. Upon this sandy stratum the skeleton seemed to stand, so that the upper side of the foot was covered by the black earth ; the sole rested immediately upon the sand. We found all the feet placed thus, the surface of the sandy stratum being apparently quite level.”*

* *Annals of the Lyceum, &c.* vol. i. p. 145.

CHAPTER VII.

GENUS III.—ELEPHANT; *Elephas*; L.

GENERIC CHARACTERS.

THE head is of great size, supported upon a singularly short neck; the eyes are small, the ears of great extent, and, like the eyes, placed laterally. The snout is drawn out or extended to form the flexible trunk, through which is continued two canals leading from the nostrils: the extremity of the trunk is furnished with a small process, which both from its figure and mobility, appears to perform the duties of a finger. The openings to the true nasal cavities are situated very high upon the head, and the bones of the nose are very thick, small, and triangular. The sinuses or cavities between the plates of the frontal and maxillary bones are enormously large, and increase to a great degree the volume of the skull. The lower jaw is massive and rounded at its angle: its branches terminate at the chin in a pointed extremity, between the sides of which there is a deep gutter or furrow.

The body is very large, and sustained at a considerable height from the ground, by long and strong bones, whose articular surfaces are arranged upon a vertical line. The head of the thigh-bone is in the axis of its shaft, and the cotyloid cavity for its reception, is situated far forward, or rather on the inferior surface of the pelvis. The limbs are five-toed, but the digits are entirely concealed by the integuments, though their situations are designated externally by an equal number of horny plates, or small hoofs, on the inferior surfaces of the feet. On the hind feet one or two of these plates are sometimes deficient. The tail is of moderate length, and terminated by a brush or tuft of coarse hairs. The stomach is simple, the intestines of great volume, and the cæcum of vast magnitude: the liver has two lobes, but no gall-bladder. The teats, two in number, are situated upon the chest, between the fore limbs.

Dental System.

10 Teeth: { 6 Upper { 2 Incisive, (in the form of great tusks.)
 4 Molar.
 4 Lower { 4 Molar.

The superior incisive teeth, are, in this genus, represented by tusks of ivory, which are frequently of great length and thickness. They are cylindrical, arcuated downwards, and turned up at the point. Their texture consists of a peculiar osseous matter of a fine grain, which is intermingled with a harder and more compact substance, arranged in convergent curved lines, which cross each other, so as to form very regular curvilinear lozenges. There is, moreover, a slight covering of true enamel to these tusks.

The molar teeth are made up of vertical and transverse layers, each of which is formed of osseous matter, surrounded by a plate of enamel, and the whole connected together by a solid inorganic substance or cement. These teeth grow obliquely from the posterior to the anterior part of the jaw.*

SPECIES 1.—The Fossil Elephant.

Elephas Primogenius; BLUMENB.

Elephant Fossile, ou du Mammouth des Russes; C. Ossem. Foss. Nouv. ed. i. 75.
MITCHILL, Geological Appendix to Cuvier's Theory of the Earth.

The discovery of elephant bones in North America is a curious fact, which forcibly arrests attention and invokes a train of far-extending reflections relative to the mutations produced in the animal world, by the irresistible causes which, at various periods, have entirely changed the conditions of the earth's surface. In the early ages of the world, the fossil elephant, now utterly extinct, must have been extensively and abundantly distributed over the earth, as fragments of its skeleton have been disinterred not only in Asia, and throughout Eu-

* See Desmarest, *Mammalogie* p. 381. F. Cuvier, *Des dents* etc. p. 221, and for a most luminous and ample account of the dentition of this genus, the reader may, with great profit, refer to the paper on Living and Fossil Elephants, contained in the first volume (new edition) of Cuvier's *Recherches sur les Ossements Fossiles*. Corse, in the *Philosophical Transactions*, 1799, has given a great number of interesting details. Blake's work on the structure and formation of the teeth in man and various animals, is also of great value, in relation to these teeth.

repe. but in various parts of North America. From the greater numbers of bones which have been discovered, and the fortunate preservation of the entire animal in the almost eternal ice of Siberia, less doubt is felt concerning the peculiar characters of this than any other extinct species.

Two living species of the elephant are well known as inhabitants of Asia and Africa, whence they are named; the varieties of these species are neither numerous nor remarkable. The Asiatic is distinguished from the African by superior size and other peculiarities, the most striking of which is the arrangement of the perpendicular plates in the huge grinders; these, in the first named species, exhibit transverse undulating ribbons of enamel, while those of the African display on their crowns a succession of lozenge-shaped lines. The teeth of the fossil elephant, resemble the Asiatic, but have straighter and narrower ribbons of enamel.

The localities whence the fossil elephant bones have been generally procured in this country, have in numerous instances, been the same as those indicated in speaking of the mastodon. Scarcely any remains, except the teeth, have been discovered in these situations; the other bones having altogether decayed, would indicate that this elephant must have perished anterior to the remote period in which the mastodon bones were deposited in the same places. Kentucky, so remarkable for containing great numbers of the mastodon, has furnished the largest number of the teeth of the fossil elephant, but the state of South Carolina has thus far been found to contain the greatest quantity of other parts of the skeleton. Mitchill has given a figure of a fossil elephant-tooth, obtained in Monmouth county, N. J.*

Drayton informs us, in his views of South Carolina, that Col. SEAF, in 1794, discovered teeth of the elephant in Biggin Swamp, not far from the head of the west branch of Cooper river. They were found at a depth of eight or nine feet. A good figure of one of these grinders is given in Drayton's work.

According to Catesby, teeth of an elephant were found at Stono in Carolina, which were recognized by the Negroes (natives of Africa) as the grinders of that animal. This statement of Catesby is unnecessarily criticised by CUVIER, after Dr. B. S. Barton, since Catesby does not say that the Negroes recognized them as teeth of the African species of elephant, but merely that they were teeth of *an* elephant.

* Mitchill, libro. citato.

Dr. H. Hayden, of Baltimore, in his *Geological Essays*, gives an account of an elephant-tooth, which was found on the eastern shore of Maryland, in Queen Ann's county. This tooth differs considerably from the tooth either of the living or fossil species, resembling each in a certain degree. The distance from the crown to the roots of the tooth is nine inches; the grinding surface is also nine inches long, and the breadth four inches and a half. Its present weight is ten pounds, and from the convexity of its outer surface, it is thought to be a grinder of the upper jaw.

The collection of the Philadelphia Museum is enriched with various specimens of fossil elephant-teeth; and the cabinets of the American Philosophical Society, and of the Academy of Natural Science, contains numerous fragments of the skeleton of this animal.*

The characters by which the skeleton of this elephant is to be distinguished from the others, have been laid down by CUVIER, after a very extended and minute examination of vast numbers of perfect and mutilated specimens. The head is oblong, the forehead concave; the sockets for the tusks very large, and the molar teeth of great size. They are marked on the surface by parallel plates of enamel, very closely approaching each other. The lower jaw is obtuse in front. The tusks are exceedingly long, more or less arcuated spirally, and directed upwards.

We cannot offer any facts from which a sufficiently satisfactory conclusion can be drawn, relative to the time or manner in which this species became extinct; but the evidence afforded by the specimen obtained from the Siberian ice, renders highly probable the supposition that it was adapted to a much more northern climate than either of the elephants now known. The skin of this animal was covered with a long and coarse hair,† and by a finer and woolly hair, which is shorter and applied more closely to the surface.

The number of the relics of this animal found in Siberia is very great, and it is highly probable that the northern parts of

* See Appendix, E.

† Cuvier who received a piece of the skin of this animal, states that there are two, and even three, sorts of hair. The longest are from twelve to fifteen inches, of a brown colour, and about the thickness of horse-hair. Others are nine or ten inches long, rather more slender, and of a fawn colour. The wool, which seems to have been placed at the roots of the long hairs, is four or five inches long, somewhat fine and soft, and slightly curled, at its root especially: this is of a clear fawn colour.

this continent may hereafter furnish us with sufficient proofs of its abundant diffusion in the species. The explorations annually made in different parts of our southern and western country will doubtless enlarge our knowledge of this species, and afford data upon which opinions may hereafter be more advantageously based.

[We shall conclude this article by inserting a translation of great part of Mr. MICHAEL ADAMS's account of his visit to the Siberian mammoth, or extinct elephant, which was through his zealous exertions preserved from final destruction, and at present belongs to the museum of St. Petersburg.]

"I was informed at Yakoutsk, by M. Popoff, who is at the head of a company of merchants of that town, that they had discovered upon the shores of the Frozen Sea, near the mouth of the river Lena, an animal of extraordinary size, having the flesh, skin and hair in good preservation. It was believed that the fossil production known as mammoth-horns must have belonged to an animal similar to this. I commenced my journey on the 7th of June, 1806; on the 16th I arrived at the small town of Schigarsk, and near the end of the month reached Kumak-surka, whence my excursion was made to search for the mammoth. Accompanied by a Tonguse chief, *Ossip Schoumakoff*, and by Bellkoff, a merchant of Schigarsk, together with my huntsman, three Cossacks, and ten Tonguse, we set out upon our journey, mounted upon reindeer.

"On the third day of our journey we pitched our tents a few hundred paces from the mammoth, upon a hillock called *Kembisugashaeta*, signifying the stone with a broad side.—Schoumakoff related the history of the discovery of the mammoth to me, in nearly the following words:

"The Tonguse, who are a wandering people, seldom remain long in one place. Those who live in the forests often spend ten years and more in traversing the vast regions among the mountains—during which period they never visit their homes. Each family lives separated from the rest; the chief takes care of them, and knows no other society. If, after several years of absence, two friends casually meet, they then mutually communicate their adventures, the various success of their hunting, and the quantity of peltry they have acquired. After spending some days together, and consuming their small stock of provisions, they separate cheerfully, charge each other with messages to their respective friends, and trust to chance for their future meetings. The Tonguse who inhabit the coast differ from the rest in having more regularly built houses, and in assembling at certain seasons for fishing and hunting. In winter they inhabit cabins built close to each other, so as to

form small villages. It is to one of these annual excursions of the Tonguse that we are indebted for the discovery of the mammoth.

"Towards the end of August, after the fishing in the Lena is over, Schoumakoff is in the habit of going, along with his brothers, to the peninsula of Turmut, where they employ themselves in hunting, and where the fresh fish of the sea furnish them with wholesome and agreeable nourishment.

"In 1799 he built for his women some cabins upon the shores of the lake Onroul; and he himself coasted along the sea-shore in order to seek for mammoth-horns. One day he observed, in the midst of a rock of ice, an unformed block, which by no means resembled the pieces of wood usually found there. He clambered up the ice and examined the new object on all sides. The ensuing year he found at the same spot the carcass of a walrus, and remarked that the mass he had formerly examined was freer from the ice, and by the side of it he perceived two similar pieces, which he afterward found were the feet of the animal. About the close of the next summer, the entire flank of the animal, and one of the tusks, had distinctly come out from under the ice. Upon his return to the shores of the lake Onroul, he communicated this extraordinary discovery to his wife and some of his friends; but their manner of regarding the subject overwhelmed him with grief. The old men related, on this occasion, that they had heard their forefathers say that a similar monster had formerly shown itself in the same peninsula, and that the whole family of the person who had discovered it had become extinct in a very short time. In consequence of this, the mammoth was regarded as auguring a future calamity, and the Tonguse chief felt so much inquietude from it that he fell dangerously ill; but recovering again, his first suggestions were of the profit he might gain by selling the tusks of the animal, which were of extraordinary size and beauty. He therefore gave orders that the place where the animal was found should be carefully concealed, and all strangers removed from it under various pretexts, charging at the same time some trusty dependents not to suffer any part of this treasure to be carried away.

"The summer proved colder and more windy than usual, and kept the mammoth sunk in the ice, which scarcely melted all that season. At last, about the end of the fifth year afterward, the ardent desires of Schoumakoff were happily accomplished: the ice which enclosed the animal having partly melted, the level became sloped, and this enormous mass, pushed forward by its own weight, fell over upon its side on a sand-bank. Of this, two Tonguse, who accompanied me in

my journey, were witnesses. In the month of March 1804, Schoumakoff came to his mammoth, and having cut off the tusks, exchanged them with the merchant Baltounoff for goods of the value of fifty rubles. On this occasion a drawing of the animal was made, but it was very incorrect; they described it with pointed ears, very small eyes, horse's hoofs, and a bristly mane along the whole of his back, so that the drawing represented something between a pig and an elephant.

"Two years afterward, being the seventh from its first being discovered, a fortunate circumstance caused my visit to these distant and desert regions, and I congratulate myself upon having had it in my power to ascertain and verify a fact which would otherwise be thought so improbable. I found the animal still in the same place, but exceedingly mutilated. The prejudices against it having been dissipated by the Tonguse chief's recovery, the carcass might be approached without difficulty: the proprietor was content with the profit he had derived from it, and the Yakouts of the neighbourhood tore off the flesh, with which they fed their dogs. Ferocious animals, polar bears, gluttons, wolves, and foxes, preyed upon it also, and their burrows were seen in the neighbourhood. The skeleton, almost unfleshed, was entire, with the exception of one of the fore feet. The back-bone, from the head to the os coccygis, the pelvis, and the remains of the three extremities, were still firmly attached by the ligaments of the joints, and by strips of skin on the exterior side of the carcass. The head was covered with a dry skin; one of the ears, well preserved, was furnished with a tuft of bristles. All these parts must necessarily have suffered by a carriage of several thousand miles. The eyes, however, are preserved, and we can still distinguish the ball of the left eye. The tip of the under lip has been eaten away, and the upper part being destroyed, the teeth were laid bare. The brain was still within the cranium, but appeared dry.

"The parts least damaged are a fore foot and a hind one; they are covered with skin, and still have the sole attached. According to the assertion of the Tonguse chief, the animal had been so large and well fed that its belly hung down below the knee-joints. This animal was a male with a long mane at his neck, but it has no tail and no trunk.* Three-fourths of the skin were obtained; the whole is of a dark gray and covered with reddish hair and black bristles. The humidity of

* These parts were, doubtless, removed by the animals which fed on the carcass.

the soil where the animal had lain so long has deprived the bristles of some parts of their elasticity. The entire skeleton is about nine feet and a half high,* and is fourteen feet in length from the tip of the nose to the coccyx.† The tusks are nine feet long, and weigh each two hundred pounds.‡ The head alone weighs four hundred and sixty pounds.

"The bones were separated and arranged with scrupulous care; and I had the satisfaction of finding the other shoulder-blade, which lay in a hole. I afterward caused the skin to be stripped from the side upon which the animal had lain: it was in good preservation. This skin was of such extraordinary weight, that ten persons, who were employed to carry it to the sea side, to stretch it upon floating wood, moved it with great difficulty. After this was accomplished, I caused the ground to be dug in various places, in order to see if there were any bones around, but chiefly for the purpose of collecting all the bristles, which the white bears might have trodden into the wet ground on devouring the flesh. This operation was attended with difficulty, on account of the deficiency of proper tools for digging; however, we succeeded in procuring more than forty pounds§ of bristles.

"The place where I found this animal is sixty paces distant from the sea shore, and about one hundred paces distant from the ice, whence it had fallen down. The fracture in the ice, is exactly in the middle between the two points of the isthmus, and is three wersts long, and in the place where the body of the animal was situated, the rock of ice has a perpendicular elevation of one hundred and eighty or one hundred and ninety feet. Its substance is clear ice, but of a nauseous taste; it slopes towards the sea. Its summit is covered by a bed of moss and friable earth, more than a foot in thickness. During the heat of the month of July, a part of this crust melts, but the other remains frozen. Curiosity prompted me to ascend two other hillocks, equally distant from the sea; they were of the same composition, and also slightly covered with moss. At intervals, I saw pieces of wood, of an enormous size, and of all the species produced in Siberia; and also mammoth horns, (elephant tusks,) in great quantities, frozen between the fissures of the rocks. They appeared to be of an astonishing freshness."]

* Four archines.

† Seven archines.

‡ Each five poods.

§ More than one pood.

CHAPTER VIII.

ORDER VI.—PECORA; *Ruminant Animals.*

THESE animals are peculiarly distinguished by having no incisive teeth in the upper jaw, the intermaxillary bone, covered by a hardened gum, being opposed to the incisors of the lower jaw, which are almost universally eight in number. Between these and the molar teeth, there is a vacant space, except in certain genera, having one or two canines. There are very uniformly six molars on each side of both jaws; these have their crowns marked by two double crescents, the convexity of which in the upper jaw, is turned inwards, and in the lower jaw outwards.

The feet are all two-toed, and these toes are covered by two hoofs, which approach each other by flat surfaces, whence they have the appearance of a single hoof cleft in the middle, a circumstance which has obtained for these animals, in various languages, the designation of cloven footed, &c. In some genera, there are behind these hoofs, two small ones, or rudimental hoofs, which are the only traces of lateral toes. The two bones of the metacarpus and metatarsus, are consolidated to form one bone, which is called the *cannon bone*.

The most singular faculty possessed by these animals is that of rumination, or of returning the food to the mouth, to subject it to a second mastication, after it has been once swallowed. This process depends on the number and peculiar arrangement of their complicated stomachs.

The first stomach is called *rumen* or paunch,* which is divided externally at its extremity into two saccular appendices, and slightly separated into four parts on the inside, having a vast number of flattened papillæ over the internal surface.

The second is called *reticulum* or honeycomb,† and is distinguished from the first by its small and globular appearance, and by the beautiful arrangement of its internal membrane, which forms polygonal acute-angled cells.

* Also *ingluvies*, *magnus venter*, *penula*.

† *Ollula*, *bonnet*, *king's hood*, &c.

The third stomach is the smallest of all, and is termed *omasum* or *feck*.^{*} Its internal membrane is arranged in longitudinal folds, varying in breadth, in a regular alternate order.

The fourth stomach is called *abomasum*, or *reed*,[†] is next in size to the paunch, and is of an elongated pear-shape, having its internal membrane simply wrinkled longitudinally like the human stomach.

The three first named stomachs are connected with each other and a groove-like continuation of the *œsophagus* in the following manner:—The groove-like continuation enters where the paunch, reticulum, and omasum, approach each other, and thence it is continued with the groove which ends in the third stomach. The groove is therefore open to the first stomachs, which lie to its right and left. The thick and prominent margins of this groove allow them to be drawn together, so as to form a complete tube, and then the *œsophagus* is continued direct into the third stomach.[‡]

The most generally received opinion on the act of rumination, is, that the food is coarsely broken at the first mastication, and when swallowed passes into the paunch. It is thence gradually passed into the second stomach, where it undergoes a certain degree of maceration in the fluids of the organ, and is formed into little balls, which by a sudden contraction of this stomach, are impelled through the *œsophagus* or gullet to the mouth. It is then subjected to the second more effectual mastication,[§] is again swallowed, and passes directly into the third stomach, and after remaining in this for a certain time, it finally enters the fourth, simple or true digestive stomach. This account of the stages of the act of rumination, is adopted by BLUMENBACH, CUVIER, &c. TOGGIA,^{||} in part following the doctrine of BRUGNONE, sustains the opinion that the food, after the first mastication, enters the *paunch* only, and not the reticulum or second stomach. In the paunch, moreover, by the fluids which are poured out from its internal surface, and by the structure and regular movements of its parietes, the mass is softened, divided, and formed into small pellets, which are brought by the contractions of the organ to its cardia, and ascend the *œsophagus* to the mouth, for the second mastication. Then the food is returned to the reticulum

* *Echinus*, *conclave*, *centipellis*, *manyplies*, *book*, *feuillet*.

† *Faliscus*, *ventriculus intestinalis*.

‡ See Blumenbach's *Comp. Anat.* p. 137.

§ Vide Cuvier, *Regne Animal*, 247.

|| *Della ruminazione e digestione de'Ruminanti*; Turino 1819, 8vo. op. cit. per Ranzani.

by means of the groove-like continuation; there it remains for a certain time, unless the matter be mixed or fluid, in which case it passes at once into the third or fourth stomach. Toggia is persuaded that it occurs in this and in no other way, because, 1st, when he had attentively examined the structure of the groove, he was convinced that nothing but finely comminuted food could pass through it, and not herbage but once and imperfectly masticated. 2d, When he examined the stomachs of ruminant animals killed either at the commencement of the rumination, during this process, or immediately after it, he found the food which had been only once masticated, in the paunch alone; the food reduced by the second mastication, was contained in the reticulum or second stomach; that which was imbued with fluid in the omasum or third; and, finally, abundantly mixed with fluids or in a semifluid state, in the abomasum or fourth stomach.*

The rumen, or paunch, is comparatively small in the young or suckling animal, and does not acquire its enormous size until it has been for some time the receptacle of food. The intestinal canal is very long in ruminant quadrupeds, but not voluminous in the larger portion; the cæcum itself is long and rather even. The teats are situated between the thighs.

The fat of these animals is remarkable for its hardness when cooled; it may then be broken into pieces. It is well known in commerce and the arts, under the name of *tallow*.

To this order of animals man is more largely indebted than to all the rest of animated nature. The mass of his food is obtained from their flesh, and there is no part of their bodies from which he does not derive additions to his comforts, and assistance to his arts. Their hides, horns, bones, hair, flesh, fat, milk, and even their blood, are in hourly demand. Many of them during their lives, yield him valuable services as beasts of draught and burthen, and contribute amply to his sustenance and luxury when they are finally slaughtered. Peaceful and patient in their dispositions, they feed exclusively on the verdure which is scattered over the earth, and prepare this vegetable matter most efficiently for the use of man and other creatures, by converting it into their own flesh, which is edible throughout all the members of the order, and in a large proportion is delicious food.

* Ranzi Elementi di Zoologia, tomo 2do. parte 3a.

CHAPTER IX.

GENUS IV.—CERVUS ; L. *Deer*.

Gr. *Elaphs*.
Lat. *Cervus*.

Fr. *Cerf*.
Germ. *Hirsch*.

GENERIC CHARACTERS.

THE head, which is elongated, is not very large, and most generally terminates by a smooth membranous surface, which is called the muzzle ; the nostrils are acutely oval and laterally situated ; the eyes large and well proportioned, having the pupils transversely extended. At a short distance below the inner angle of the eye a peculiar pouch or cavity, is found in most of the species, which secretes an unctuous humour in small quantities ; these cavities are called *larmiers* by the French naturalist. The ears are large and pointed ; the neck is of moderate length, the body plump, and the limbs slender, though strongly knit. The teats are inguinal, and four in number ; the gall bladder does not exist in these animals. The tail is short.

The hair is very similar in colour throughout the species of this genus, and is dry and harsh ; the young deer or fawns are mostly spotted with white upon a brownish yellow ground.

The males of this genus are all provided with horns, which are variously branched, or palmated, and are annually caducous. These horns are remarkable for being composed of *bone*, which is solid, throughout, and in its first or growing state is covered by a velvet-like membrane, through which blood circulates with great freedom. The horn commences its growth from a basis or peduncle which is attached to the frontal bone, having something of the form of a truncated cone ; a short distance above this, on the level of the outer surface of the skin of the head, the horn is expanded in the form of an irregular tuberculous ring, which is called the *burr*,* above which the solid part of the horn rises to form the various branches or plantations, according to the species. The blood-vessels going to the horn, are very large at the commence-

* The part commonly used for cane-heads, &c.

ment, and during its growth, and the extension of the velvet-like membrane, is as rapid as the advance of the bone or horn. As soon as the horn attains its full growth, the blood-vessels contract and diminish, until they cease to convey blood to the velvet membrane, which then dries, loses its sensibility, and gradually flakes off. After the rutting season, a slight tumescence occurs at the edge of the peduncle, and the whole horn is at length detached and falls off.

Dental System.

32 Teeth :	12 Upper	0 Incisive	6 False
		0 Canine	6 True Molars.
		2 Molar.	
	20 Lower	8 Incisive	6 False
		0 Canine	6 True Molars.
		2 Molar.	

IN THE UPPER JAW the three first molars are bordered by a thick crest at their internal edges ; the two following are formed of two parts, each of which is composed of a single tubercle, having two crests in front, one on the outside, terminating abruptly ; the other on the inside, which descends as far as the middle of the height of the tooth, and then rises upwards to rejoin the anterior border of the principal tubercle ; between this crest and the tubercle, there is a hollow. When the tubercle begins to wear, it exhibits a portion of a narrow circle, bordered by enamel. The last molar differs from the two preceding solely in being somewhat narrower, and in having thinner crescents.

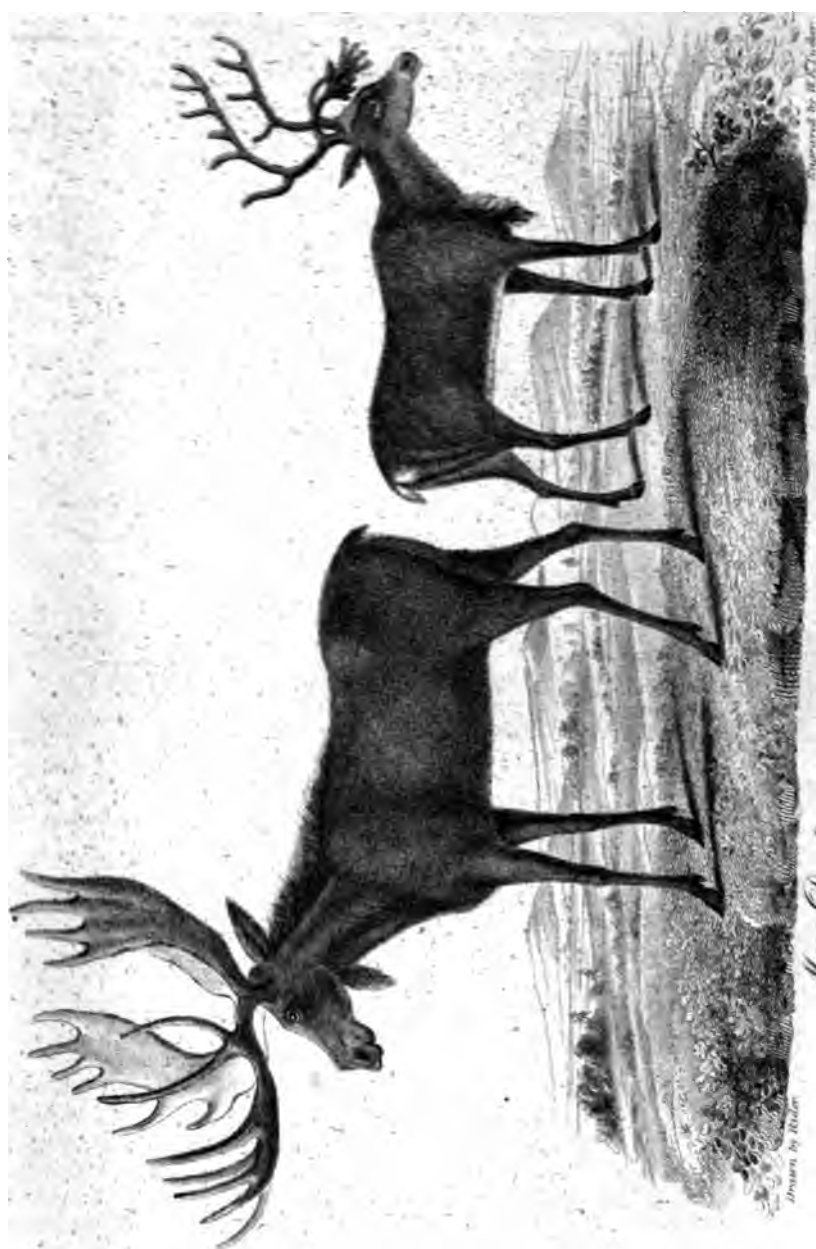
IN THE LOWER JAW the first incisor is the largest, the second and third are somewhat less than the other, and the last is very small. They are all trenchant, inclined forwards, and separate themselves slightly from the median line. The two first false molars are simple, the third has a spur at its posterior part, and the three last differ very slightly from each other.

In their reciprocal position the inferior incisors correspond to the superior maxillary bone ; the molars are alternate.

The writings of naturalists exhibit great confusion relative to the North American species of deer. Much of this evil is attributable to the loose manner in which species have been proposed upon the authority of persons unqualified to distinguish between accidental varieties, dependent upon sex or age, and those permanent characteristics indicative of specific constitution.

CUVIER, with his usual acumen and amplitude of research, has turned his attention to this subject, with great advantage





to students of natural history. Though he may not have been the first or only naturalist who knew and discriminated correctly the North American species, he is the first who has displayed his researches in such a manner as will enable every one to satisfy himself of the accuracy of his deductions.* He has admitted the following to be the species now inhabiting this country, all the others named as distinct in the books being mere varieties: *C. Alces*, the Moose; *C. Canadensis*, the American Elk; *C. Tarandus*, the Rein Deer; *C. Virginianus*, the Common Deer.

To this list must be added the *C. Macrotis*, Mule or Black-tail Deer, first indicated by Lewis and Clarke, and described by SAY, under the name just given, in Long's Expedition to the Rocky Mountains.

SPECIES I.—*The Moose.*

Cervus Alces; L.

Alces, Achis: PLIN. ALD. GESN. JONST.

Original: CHARLEV. Nouv. France, iii. 126.

Elas: BUFF. Hist. Nat. xii. Supp. vii.

Elk: SHAW, Ged. Zool. ii. pt. 2. 174.

Moose Deer: DUDLEY, Phil. Trans. No. 444. WARDEN, DESCRIPT. des Etats Unis. v. p. 636.

Elk: PENN. Hist. Quad. No. 42. *Moose*: IB. Arct. Zool. i. No. 3. p. 18.

The Mooset is perhaps the only deer whose general appearance can be called ungraceful, or whose proportions at first sight impress the beholder unfavourably. Its large head terminates in a square muzzle, having the nostrils curiously alouched over the sides of the mouth; the neck, from which rises a short thick mane, is not longer than the head, which in males is rendered still more cumbrous and unwieldy, by wide palmated horns: under the throat is found an excrescence from which grows a tuft of long hair; the body, which is short and thick, is mounted upon tall legs, and the whole aspect is so unusual that incidental observers are pardonable for considering it ugly. Yet as these singularities of structure have direct or indirect reference to peculiarities of use, an inquiry into the mode of life led by this species, may cause us to forget, in admiration of its adaptation to circumstances, prejudices excited by the comparative inelegance of its form.

* Ossements Fossiles, nouv. ed. tome iv.

† This appellation is derived from *Musu*, the name given to the animal by the Algonquins.

The moose inhabits the northern parts of both continents;* on the American it has been found as far north as the country has been fully explored; its southern range, at former periods, extended to the shores of the great lakes and throughout the New-England States. At present it is not heard of south of the state of Maine, where it is becoming rare. In Nova Scotia, the isle of Breton, the country adjacent to the bay of Fundy, and throughout the Hudson's Bay possessions, the moose is found in considerable numbers.

The dense forests and closely shaded swamps of these regions are the favourite resorts of this animal, as there the most abundant supply of food is to be obtained with the least inconvenience. The length of limb and shortness of neck, which in an open pasture appear so disadvantageous, are here of essential importance, in enabling the moose to crop the buds and young twigs of the birch, maple, or poplar, or should he prefer the aquatic plants, which grow most luxuriantly where the soil is unfit to support other animals, the same length of limb enables him to feed with security and ease. We cannot avoid believing that the peculiar lateral and slouching position of the nostrils is immediately connected with the manner in which the moose browses. Their construction is very muscular, and seems well adapted for seizing and tearing off the twigs and foliage of trees, and conveying them to the mouth; it may also be designed to prevent the sense of smell from being at any time suspended by the prehension of food. The probability of this last suggestion is strengthened by the fact that the moose is endowed with an exquisite sensibility of smell, and can discover the approach of hunters at very great distances. When obliged to feed on level ground, the animal must either kneel or separate the legs very widely; in feeding on the sides of acclivities, the moose does so with less inconvenience by grazing from below upwards; the steeper the ground may be, so much the easier it is for this species to pasture. Yet, whenever food is to be procured from trees and shrubs, it is preferred to that which is only to be obtained by grazing.

The moose, like his kindred species, is a harmless and peaceful animal, except in the season when the sexes seek each other. Then the males display a fierceness and pugnacity which forms a strong contrast to their ordinary actions; were they examined only during such seasons, the character of the species would be entirely misconceived. Under the in-

* It is, in Europe, called "Elk."

fluence of this powerful, though temporary excitement, the males battle furiously with each other, and resist the aggressions of man himself with vigour and effect.

In the summer the moose frequents swampy or low grounds near the margins of lakes and rivers, through which they delight to swim, as it frees them for the time from the annoyance of insects. They are also seen wading out from the shores, for the purpose of feeding on the aquatic plants which rise to the surface of the water. At this season they regularly frequent the same place in order to drink, of which circumstance the Indian hunter takes advantage to lie in ambush, and secure the destruction of the deer. At such drinking places as many as eight or ten pairs of moose horns have been picked up.

During the winter the moose, in families of fifteen or twenty, seek the depths of the forest for shelter and food. Such a herd will range throughout an extent of about five hundred acres, subsisting upon the mosses attached to the trees, or browsing the tender branches of saplings, especially of the tree called moose-wood. The Indians name parts of the forest thus occupied moose-yards.

In Nova Scotia, New Brunswick, and the island of Grand-manan, the moose is generally hunted in the month of March, when the snow is deep, and sufficiently crusted with ice to bear the weight of a dog, not that of a moose, as has been stated. Five or six men, provided with knapsacks, containing food for as many days, and all necessary implements for building their "camp" at night, set out in search of a moose-yard. When they have discovered one, they collect their dogs and encamp for the night, in order to be ready to commence the chase at an early hour, before the sun softens the crust upon the snow, which would be the means of retarding the dogs, and facilitating the escape of the deer. At daybreak the dogs are laid on, and the hunters, wearing large snow shoes, follow as closely as possible. As soon as the dogs approach a moose, they assail him on all sides, and force him to attempt his escape by flight. The deer, however, does not run far, before the crust on the snow, through which he breaks at every step, cuts his legs so severely, that the poor animal stands at bay and endeavours to defend himself against the dogs by striking at them with his fore feet. The arrival of the hunter within a convenient distance soon terminates the combat, as a ball from his rifle rarely fails to bring the moose down.

Judging by the rapid diminution of this species within a comparatively few years, it is to be feared that it will, at no great distance of time, be exterminated. The moose is easily tamed, although of a wild and timid disposition; sometimes

when taken very young they are domesticated to a remarkable degree. We are informed by our friend Mr. Vanbuskirk, of New Brunswick, that he knew of one which was taken when two days old, by an Indian, and presented to a gentleman in Nova Scotia. The proprietor allowed it to suck a cow for three months, and afterward fed it with different vegetables, until it was a year old. This moose displayed a singular animosity against one of the young ladies of the family, and would chase her with fierceness into the house. When the door was closed in time to exclude him, he would immediately turn round and kick violently against it.*

The horns of the moose spread out almost immediately from their base into a broad palmation: in old animals they increase to a great size, and have been known to weigh fifty six pounds, each horn being thirty-two inches long. The horns are generally cast in the month of November; the Indians employ them for various purposes, cutting them into spoons, scoops, &c.

When chased, the moose throws his horns towards his neck, elevates his nose, and dashes swiftly into the thickest of the forest; occasionally the horns prove the means of his destruction, by being entangled among vines, or caught between small trees. Where the moose runs over a plain, he moves with great celerity, although his gait is nothing better than a sort of long shambling trot: this, however, is rendered very efficient, by the great length of his limbs. While running in this manner the divisions of the hoofs, which are very long, separate as they press the ground, and close together as they are raised, with a clattering sound, which may be heard to some distance; this circumstance is also remarked in the rein-deer.

Notwithstanding the ease and swiftness of their movements, they would be easily captured, if pursued by horsemen and

* "In the year 1777, an Indian had two young moose so tame, that when on his passage to Prince of Wales's fort in a canoe, the moose always followed him along the bank of the river, and at night, or on any other occasion, when the Indians landed, the young moose generally came and fondled on them in the same manner as the most domestic animal would have done, and never offered to stray from the tents. Unfortunately, in crossing a deep bay in one of the lakes, on a fine day, all the Indians that were not interested in the safe landing of those engaging creatures, paddled from point to point; and the man that owned them not caring to go so far about by himself, accompanied the others in hopes they would follow him round as usual. But at night the young moose did not arrive, and as the howling of some wolves was heard in that quarter, it was supposed they had been devoured by them, as they were never afterward seen."—HEARNE, 8vo. ed. p. 258.

hounds, in a country adapted to such a chase, as they are both short breasted and tender footed.

The acuteness of their sense of hearing, thought to be that which is possessed by the moose in the greatest degree of perfection, together with the keenness of their smell, renders it very difficult to approach them. The Indians attempt it by creeping among the trees and bushes, always keeping to the leeward of the deer. In summer, when they resort to the borders of lakes and rivers, the Indians often kill them while crossing the streams, or when swimming from the shore to the islands. "They are," says HEARNE, "when pursued in this manner, the most inoffensive of all animals, never making any resistance; and the young ones are so simple, that I remember to have seen an Indian paddle his canoe up to one of them and take it by the poll, without the least opposition: the poor harmless animal seeming at the same time as contented alongside the canoe as if swimming by the side of its dam, and looking up in our faces with the same fearless innocence that a house-lamb would, making use of its fore foot almost every instant to clear its eyes of mosquitoes, which at that time were remarkably numerous."

The flesh of the moose, though generally coarser and tougher than other venison, is esteemed excellent food, and the Indians, hunters and travellers, all declare they can withstand more fatigue while fed on this meat than when using any other. The large and gristly extremity of the nose is accounted an epicurean treat, and the tongue of the animal is also highly praised, notwithstanding it is not commonly so fat and delicate as the tongue of the common deer. As the moose feeds upon the twigs, buds and small branches of the willow, birch poplar, mosses, aquatic plants, &c. its flesh must be peculiarly flavoured. "The fat of the intestines is hard like suet, but all the external fat is soft, like that of a breast of mutton, and when put into a bladder is as fine as marrow. In this they differ from all the other species of deer, of which the external fat is as hard as that of the kidneys."* The female moose never has any horns; they bring forth their young, "from one to three in number, in the latter end of April or beginning of May."†

The male moose often exceeds the largest horse in size and bulk; the females are much less than the males, and differently coloured. The hair of the male is long and soft like that of a common deer; it is black at tip, but within it is of an ash

* Hearne.

† Hearne.

colour, and at the base pure white. The hair of the female is of a sandy brown colour, and in some places, especially under the throat, belly and flank, is nearly white at tip, and altogether so at base.

The skin of the moose is of great value to the Indians, as it is used for tent covers, clothing, &c. We shall defer the account of the methods of dressing these and other deer skins, until we treat of the common deer, when we shall describe the Indian modes of currying proper to each of these skins.

The moose, like other deer inhabiting the northern regions, is exceedingly annoyed by insects, which not only feast upon its blood, but deposit their eggs in different parts of its body, along the spine, within the cavities of the nose, mouth, &c.—These eggs when hatched form large larvæ or maggots, that feed on the parts within which they are placed, until ready to assume their perfect or winged condition, when they perforate the skin and take flight. So great a number of such perforations are made at certain seasons, that the skins of the moose are rendered worthless to the hunter, unless it be for the purpose of cutting them into thongs for nets and other uses.

SPECIES II.—*The Rein-Deer.*

CERVUS TARANDUS; L.

Tarandus: PLIN. Hist. Nat. viii. c. 34.

ÆLIAN, Anim. ii. c. 16.

Caribou: CHARLEY. Nouv. France, iii. p. 129; DOBBS, Hudson's Bay, 20.

Greenland Deer: CATESBY's Carolina, App. p. 28.

Renne: BUFF. Hist. Nat. xii.

Reinther Tharandthier: GENS. Thierb. p. 206, 209.

Greenland Buck: EDW. AV. 1, tab. 51.

Rein-Deer: PENN. Arct. Zool. IBID. Quad. p. 46.

This valuable animal is found in great abundance in the northern parts of both continents, and constitutes a very considerable part of the subsistence of the tribes inhabiting the regions it frequents. In the northern parts of Asia and Europe, the rein-deer has been domesticated for a long time, and with the exception of the dog, is the only beast of draught or burthen possessed by the natives. The North American Indians, however, have never profited by the docility of this animal to aid them in transporting their families or property, though they annually destroy great numbers of them for the sake of their flesh, hides, horns, &c.

During the winter they take shelter in the forests, whence they are occasionally induced by the occurrence of a few fine days to pay a short visit to their favourite pastures on the bar-

ren grounds, which are covered with a profusion of mosses. Their great movement to the northward commonly begins towards the end of April when the snow first melts from the sides of the hills; they are found on the banks of the Copper-Mine River early in May, at which time a considerable extent of ground is free from snow. In this spring migration the females take the lead and bring forth their young on the sea-coast about the end of May or beginning of June. They retire from the sea-coast in July and August, but linger in the vicinity of the barren grounds as late as October, whence they seek their winter retreats in the woods.

In their migrations the whole herd frequently amounts to one or two thousand, and is separated into smaller herds, varying in number from ten to a hundred, as chance or their fears may determine them to unite or separate. The Indians have remarked that there are certain places which the rein-deer invariably visit in their migrations to and from the coast, and that they always travel against the wind. In the barren grounds the principal food of this species is the various lichens or mosses; the hay or dry grass found in the swamps during autumn is also eaten, and in the woods the mosses attached to the trees. "They are accustomed to gnaw their fallen antlers, and *are said* also to devour mice."

Some rein-deer are never met with except in the woody country, and they are much larger than those which visit the coast. This variety is stated to weigh from 200 to 240 lbs., while the weight of the common rein-deer, exclusive of the offal, varies from 90 to 130 lbs. The large variety are found to have their skins as much perforated by the larvæ of the gad-fly as the others, which is considered as a presumptive proof by Capt. Franklin, that the smaller deer are not driven to the sea-coast and islands of the Polar sea by the attacks of that insect. A few rein-deer killed in the spring are found to have their skins uninjured, and these are always fat, though all the other deer are lean at the same season.

As we have not had an opportunity either of becoming acquainted with this species in its native wilds, or of seeing any individuals in a state of captivity, we shall here introduce an account from the accurate observations of HEARNE, confirmed by the recent and interesting remarks of Capt. FRANKLIN, given in the narrative of his first and memorable journey to the shores of the polar sea.

"When the Indians design to impound deer, they look out for one of the paths in which a number of them have trod, and which is observed to be still frequented by them. When these paths cross a lake, a wide river, or a barren plain, they are

found to be much the best for the purpose; and if the path run through a cluster of woods, capable of affording materials for building the pound, it adds considerably to the commodiousness of the situation. The pound is built by making a strong fence of brushy trees, without observing any degree of regularity, and the work is continued to any extent, according to the pleasure of the builders. I have seen some that were not less than a mile round, and am informed that there are others still more extensive. The door or entrance of the pound is not larger than a common gate, and the inside is so crowded with small counter hedges as very much to resemble a maze, in every opening of which they set a snare made with thongs of parchment, deer skins, &c. twisted together, which are amazingly strong. One end of the snare is usually made fast to a growing pole; but if no one of sufficient size can be found near the place where the snare is set, a loose pole is substituted, which is always of such size and length, that a deer cannot drag it far before it gets entangled among the other woods, which are all left standing, except what is found necessary for making the fence, hedges, &c.

"The pound being thus prepared, a row of small brushwood is stuck up in the snow on each side the door or entrance, and these hedgerows are continued along the open part of the lake, river or plain, where neither stick nor stump besides is to be seen. These poles or brushwood are generally placed at the distance of fifteen or twenty yards from each other, and ranged in such a manner as to form two sides of a long acute angle, growing gradually wider in proportion to the dimensions of the pound, which is sometimes not less than two or three miles, while the deer-path is exactly along the middle, between the two rows of brushwood.

"Indians employed on this service always pitch their tent on or near to an eminence that affords a commanding prospect of the path leading to a pound; and when they see any deer going that way, men, women and children, walk along the lake or river side, under cover of the woods, until they get behind them, then step forth to open view, and proceed towards the pound in the form of a crescent. The poor timorous deer, finding themselves pursued, and at the same time taking the two rows of bushy poles to be two ranks of people stationed to prevent their passing on either side, run straight forward in the path till they get into the pound. The Indians then close in, and block up the entrance with some brushy trees that have been cut down and lie at hand for that purpose. The deer being thus enclosed, the women and children walk round the pound to prevent them from jumping over the fence, while the

men are employed in spearing such as are entangled in the snares, and shooting with bows and arrows those which remain loose in the pound. This method of hunting, if it deserves the name, is sometimes so successful that many families subsist by it without having occasion to remove their tents above once or twice during the whole course of a winter; and when the spring advances both the deer and Indians draw out to the eastward, on the ground which is entirely barren, or at least what is so called in those parts, as it neither produces trees nor shrubs of any kind, so that moss, and some little grass, is all the herbage to be found on it.

"The great destruction of the deer in the month of August, for the sake of their skins, which are then fittest for use, is almost incredible; and as they are never known to have more than one fawn at a time, it is wonderful they do not become scarce. But so far is this from being the case, that the oldest northern Indian will affirm, that the deer are as plentiful now as they ever have been; and though they are remarkably scarce some years near Churchill river, yet it is said, and with great probability of truth, that they are more numerous in other parts of the country than they were formerly. The scarcity or abundance of these animals in different places at the same season, is caused in a great measure, by the winds which prevail for some time before; for the deer are supposed by the natives to walk always in the direction from which the wind blows, except when they migrate from east to west, or from west to east, in search of the opposite sex.

"It requires the prime parts of from eight to ten deer skins to make a complete suit of warm clothing for a grown person during the winter; all of which should, if possible, be killed in the month of August or early in September, for after that time the hair is too long, and at the same time so loose in the pelt, that it will drop off with the slightest injury. Besides these skins, which must be in the hair, each person requires several others to be dressed into leather, for stockings and shoes and light summer clothing. Several more are also wanted in a parchment state to make *clewla*, as they call it, or thongs for the nettings of snow-shoes, snares for deer, sewing for their sledges, and in fact for every other use where strings or lines of any kind are required; so that each person on an average expends, in the course of a year, upwards of twenty deer skins in clothing and other domestic uses, exclusive of tent cloths, bags, and many other things. All skins for the above mentioned purposes are, if possible, procured between the beginning of August and the middle of October; for when the rutting season is over, and the winter sets in, the deer skins are not

only very thin, but in general full of worms and warbles, which render them of little use, except for thongs. Indeed, the chief use that is made of them in winter is for the purpose of food; and really, when the hair is properly taken off, and all the warbles are squeezed out, if they are well boiled they are far from being disagreeable. The Indians, however, never could persuade me to eat the warbles, (maggots of the gad-fly,) of which some of them are remarkably fond, particularly the children. They are always eaten raw and alive out of the skin, and are said by those who like them to be as fine as gooseberries. But the very idea of eating such things, exclusive of their appearance, (many of them being as large as the first joint of the little finger,) was quite sufficient to give me an unalterable disgust to such a repast.

"The month of October is the rutting season with these deer, and after the time of their courtship is over, the bucks separate from the does; the former proceed to the westward, to take shelter in the woods during the winter, and the does keep out in the barren ground the whole year. This, though a general rule, is not without some exceptions, for I have frequently seen many does in the woods, though they bore no proportion to the bucks. This rule, therefore, only stands good respecting the deer to the north of Churchill river, for the deer to the southward live promiscuously among the woods as well as in the plains, and along the banks of the rivers, lakes, &c. the whole year.

"The old buck's horns are very large, with many branches, and always drop off in the month of November, which is the time they begin to approach the woods. This is undoubtedly wisely ordered by Providence, the better to enable them to escape from their enemies through the woods, otherwise they would become an easy prey to wolves and other beasts, and be liable to get entangled among the trees, even in ranging about in search of food. The young bucks in those parts do not shed their horns as soon as the old ones; I have frequently seen them killed at or near Christmas, and could discover no appearance of their horns being loose. The does do not shed their horns till the summer, so that when the buck's horns are ready to drop off, the horns of the doe are all hairy, and scarcely come to their full growth."*

"The haunches of the male rein-deer, in the beginning of the month of October, are covered to the depth of two inches or more with fat, which is beginning to get red and high fla-

*HEARNE, *passim*. 8vo. ed.

voured, and is considered as a sure indication of the commencement of the rutting season. Their horns, which in the middle of August were yet tender, have now attained their proper size, and are beginning to loose their hairy covering, which hangs from them in ragged filaments. The horns of the rein-deer vary not only with its age and sex, but are otherwise so uncertain in their growth, that they are never alike in any two individuals. The old males shed theirs about the end of December; the females retain them until the disappearance of the snow enables them to frequent the barren grounds, which may be stated to be about the middle or end of May, soon after which period they proceed towards the sea-coast and drop their young. The young males loose their horns about the same time with the females, or a little earlier, some of them as early as April. The hair of the rein-deer falls in July, and is succeeded by a short thick coat of mingled clove, deep reddish and yellowish browns—the belly and under parts of the neck, &c. remaining white. As the winter approaches, the hair becomes longer and lighter in its colours, and it begins to loosen in May, being then much worn on the sides from the animal rubbing itself against trees and stones. It becomes grayish and almost white before it is completely shed. The Indians form their robes of the skins procured in autumn, when the hair is short. Towards the spring the larvæ of the œstrus, attaining a large size, produce so many perforations in the skins that they are good for nothing. The cicatrices only of these holes are to be seen in August, but a fresh set of ova have in the mean time been deposited.*

“The herds of deer are attended in their migrations by bands of wolves, which destroy a great many of them. The Copper Indians kill the rein-deer in summer with the gun, or taking advantage of a favourable disposition of the ground, they enclose a herd upon a neck of land and drive them into a lake, where they fall an easy prey; but in the rutting season, and in the spring, when they are numerous on the skirts of the woods, they catch them in snares. The snares are simple nooses formed in a rope made of twisted sinew, which are placed in the aperture of a slight hedge constructed of the branches of trees.

* “It is worthy of remark, that in the month of May a very great number of large larvæ exist under the mucons membrane at the root of the tongue and posterior part of the nares and pharynx. The Indians consider them to belong to the same species with the œstrus that deposits its ova under the skin; to us the larvæ of the former appeared more flattened than those of the latter.”—*Dr. Richardson's Journal.*

This hedge is disposed so as to form several winding compartments—and although it is by no means strong, yet the deer seldom attempt to break through it. The herd is led into the labyrinth by two converging rows of poles, and one is generally caught at each of the openings by the noose placed there.—The hunter, too, lying in ambush, stabs some of them with his bayonet as they pass by, and the whole herd frequently becomes his prey. Where wood is scarce, a piece of turf turned up answers the purpose of a pole to conduct them towards the snares. The rein-deer has a quick eye, but the hunter, by keeping to leeward, and using a little caution, may approach very near, their apprehensions being much more easily aroused by the smell than the sight of any unusual object. Indeed their curiosity often causes them to come close up and wheel round the hunter, thus affording him a good opportunity of singling out the fattest of the herd, and upon these occasions they often become so confused by the shouts and gestures of their enemy, that they run backwards and forwards with great rapidity, but without the power of making their escape. The Copper Indians find that a white dress attracts the most readily, and they often succeed in bringing them within gun shot, by kneeling and vibrating the gun from side to side, in imitation of the motions of a deer's horns when he is in the act of rubbing his head against a stone.

“The Dogrib Indians have a mode of killing these animals which, though simple, is very successful. It was thus described by Mr. Wentzel, who resided long amongst that people. The hunters go in pairs, the foremost man carrying in one hand the horns and part of the skin of the head of a deer, and in the other a small bundle of twigs, against which he, from time to time, rubs the horns, imitating the gestures peculiar to the animal. His comrade follows, treading exactly in his footsteps, and holding the guns of both in a horizontal position, so that the muzzles project under the arms of him who carries the head. Both hunters have a fillet of white skin round their foreheads, and the foremost has a strip of the same kind round his wrists. They approach the herd by degrees, raising their legs very slowly, but setting them down somewhat suddenly, after the manner of a deer, and always taking care to lift their right or left feet simultaneously. If any of the herd leave off feeding to gaze upon this extraordinary phenomenon, it instantly stops, and the head begins to play its part by licking its shoulders, and performing other necessary movements. In this way the hunters attain the very centre of the herd without exciting suspicion, and have leisure to single out the fattest. The hindmost man then pushes forward his comrade's gun, the



1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations. The text states that without proper record-keeping, it would be difficult to track progress, identify areas for improvement, and make informed decisions.

2. The second part of the document outlines the specific steps and procedures that should be followed to ensure that all records are kept up-to-date and accurate. It includes instructions on how to collect data, organize it, and store it securely. The text also mentions the importance of regularly reviewing and updating the records to reflect any changes or new information.

3. The third part of the document discusses the role of technology in record-keeping. It highlights how digital tools and software can help streamline the process, reduce errors, and make it easier to access and analyze the data. The text suggests that organizations should invest in reliable technology and provide training to staff to ensure they are using the tools effectively.

4. The fourth part of the document addresses the challenges that may arise when implementing a record-keeping system. It acknowledges that there may be resistance from staff or a lack of resources, but it offers strategies to overcome these obstacles. The text encourages leadership to provide support, training, and clear communication to ensure the system is adopted successfully.

5. The final part of the document concludes by reiterating the importance of record-keeping and the benefits it can bring to the organization. It states that a well-maintained record-keeping system is essential for long-term success and growth. The text ends with a call to action, urging all staff to take responsibility for their role in maintaining accurate records.



Drawn by G. G. S. S. S.

Pl. 1.

1. Horns of the animal in the 7th year of its age, 2. Horns of the animal in the 8th year.

Printed by G. G. S. S.

head is dropt, and they both fire nearly at the same instant. The herd scampers off; the hunters trot after them; in a short time the poor animals halt to ascertain the cause of their terror; their foes stop at the same instant, and having loaded as they ran, greet the gazers with a second fatal discharge. The consternation of the deer increases, they run to and fro in the utmost confusion, and sometimes a great part of the herd is destroyed within the space of a few hundred yards.”*

SPECIES III.—*The Elk.*

Cervus Canadensis; BRISS.

Cerf du Canada: PERRAULT, Mem. sur les. Anim. ii. 45.
Cervus Major Americanus: CATESBY, Carol. App. ii. 28.
Cervus Strongyloceros: SCHREB. Sæugthiere.
Alces Americanus, cornibus teretibus: JEFFERSON, Virginia, 96.
The Elk: LAWSON, New Voyage; CARVER, Travels, 417.
The American Elk: BEWICK, Quadrupeds, 112.
Cervus Wapiti: BARTON, Med. and Physical Journ. iii. 36.
Wapiti: WARDEN, Descr. des Etats Unis, v. 368; Stag, Red Deer, *IBID.* 367.
Wapiti, Mitchell, Leach, Fred. Cuvier, Mammif Lithogr. liv. 21e.
Cerf Wapiti: DESM. Mamm. Sp. 664; *Cerf. Canadien*, *IBID.* Sp. 665.
Wewashish, [Waskesue; Wawashkeesho] HEARNE, Journey, &c. 360.

[Commonly called Stag, Red Deer, Gray Moose, Le Biche, Wapiti, American Elk, Round horn Elk, Elk, &c.]

The stately and beautiful animal we are now to describe has been until very recently confounded with other species of deer, to which it bears but a slight resemblance, and from which it is distinguished by the most striking characters. The English name by which it is commonly known, and which we prefer to others, is the same as that given to the moose in Europe; hence this species was for a long time considered as a mere variety of the moose, if not identically the same. A general resemblance to the European stag, caused the application of the same name to our elk, and this circumstance led various writers into the error of considering our animal to be a variety of the *Cervus Elaphus*, or common stag of Europe. A reference to the synonymy we have prefixed to this article, will amply suffice to show how great a degree of confusion has hitherto existed upon this subject; a confusion rather increased than diminished by those who have attempted its removal by reconciling the discrepancies of books, instead of appealing to the proper and infallible authority, nature.

* Franklin's Narrative of a Journey to the shores of the Polar Sea.

HEARNE we believe to be justly entitled to the credit of having insisted upon the specific distinctness of this animal from the moose, by pointing out the error into which PENNANT had fallen, in stating the Waskesse or Wewaskish to be of the same species. The description he gives of the Wewaskish, sufficiently proves that it was our elk he described, and the characters he enumerates, satisfactorily establish the specific differences between this animal and the moose.

JEFFERSON, in his valuable notes on Virginia, without being aware of HEARNE's observations, proves very clearly that the elk of America ought to be regarded as identical neither with the moose nor stag of Europe, and proposed for our animal the name of *Alces Americanus*. Subsequently, Dr. E. H. Smith published a very interesting paper in the New-York Medical Repository, in which he described three individuals of this species, and gave a still more complete enumeration of their distinctive characters and history.

It would be as unprofitable as irksome to enter more extensively into the history of the different errors and changes respecting the classification of this deer. To us it appears sufficient to declare it to be now fully established that there is but *one* species of American Elk, upon which all the names prefixed, scientific and trivial, have been bestowed; that this species is second in size to the moose alone, and that in beauty of form, grace and agility of movement, and other attributes of its kind, it is not excelled by any deer of the old or new world.

The size and appearance of the elk are imposing; his air denotes confidence of great strength, while his towering horns exhibit weapons capable of doing much injury when offensively employed. The head is beautifully formed, tapering to a narrow point; the ears are large and rapidly movable; the eyes are full and dark; the horns rise loftily from the front, with numerous sharp pointed branches, which are curved forwards, and the head is sustained upon a neck at once slender, vigorous and graceful. The beauty of the male elk is still farther heightened by the long forward-curling hair, which forms a sort of ruff or beard, extending from the head towards the breast, where it grows short and is but little different from the common covering. The body of the elk, though large, is finely proportioned; the limbs are small, and apparently delicate, but are strong, sinewy and agile. The hair is of a bluish gray colour in autumn; during winter it continues of a dark gray, and at the approach of spring, it assumes a reddish or bright brown colour, which is permanent throughout summer. The croupe is of a pale yellowish white or clay colour, and

this colour extends about the tail for six or seven inches, and is almost uniformly found in both sexes. There is no very perceptible difference of colour between the male and female.

The female, however, does not participate in the "branching honours" of the male, which are found to attain, in numerous instances, a surprising magnitude. It is not uncommon to see them of four and five feet in height, and it is said that they are sometimes still higher. Specimens of the largest size may be seen in the cabinets of the Philadelphia Museum, and of the Lyceum of Natural History of New-York. These horns are said to consist of three principal divisions; 1st, The brow antlers, sometimes called "alters" by the hunters. 2d, The two middle prongs, named "fighting horns," and, 3d, The shaft or proper horns. The branches just mentioned are always placed on the front, outside, or posterior surface, never on the inner side of the horns, a circumstance which has been indicated as strikingly different from the arrangement of the branches of the horns of the common or Virginian deer, hereafter to be described.

The elk sheds his horns about the end of February, or beginning of March, and such is the rapidity with which the new horns shoot forth, that in less than a month they are a foot in length. The whole surface of the horn is covered by a soft hairy membrane, which, from its resemblance to that substance, is called *velvet*, and the horns are said to be "in the velvet" until the month of August, by which time they have attained their full size. After the horns are entirely formed, the membrane becomes gradually detached, and this separation is hastened by the animal, who appears to suffer some irritation, or itching, which causes him to rub the horns against trees, &c.

Almost all those who have written on this species, have dwelt upon the peculiar apparatus, situated beneath the eye, at the internal angle, which the French naturalists call *larmiers*, or *sinus lacrymales*. This apparatus is a slit, or depression, obliquely placed below the inner angle of each eye, and lined with a naked membrane, which secretes an unctuous matter, not unlike the cerumen or wax of the ear. Dr. SMITH, in the paper we have above referred to, says that "the hunters assure us that the elk possesses the power, by strictly closing the nostrils, of forcing the air through these apertures in such a manner as to make a noise which may be heard at a great distance." This, however, is inaccurate; it is true that the elk, when alarmed, or his attention is strongly excited, makes a whistling noise at the moment that these lacrymal appendages are opened and vibrated in a peculiar manner. But

having dissected these appendages in an elk, recently dead, we are perfectly assured that there is no communication between the nostril of the animal and these sacs. The bone behind these appendages, is cribriform, or reticular, but we could discover no duct nor passage by which air or any fluid could find its way. The peculiar use and importance of this structure is still unknown; it exists in several species of the genus, as already indicated in the generic characters, and nothing but a close and careful examination of these animals in a state of nature, will lead us to a correct understanding of their purpose. BARTON's notion, that "it seems in these animals to serve the purposes of an auxiliary breathing apparatus and of an organ of smelling," is altogether speculation, founded upon a "*conjecture*," as to the structure of the sac and its connexion with the nostrils.

The elk has at one period ranged over the greater part, if not the whole, of this continent. JEFFERSON has stated that he "could never learn that the round-horned elk has been seen farther north than the Hudson river." But HEARNE has described the wewaskish in such a manner, as to leave no doubt of its existence as far north as the vicinity of Cumberland House, in lat 53° 56'.

Elk are still occasionally found in the remote and thinly settled parts of Pennsylvania, but the number is small; it is only in the western wilds that they are seen in considerable herds. They are fond of the great forests, where a luxuriant vegetation affords them an abundant supply of buds and tender twigs; or of the great plains, where the solitude is seldom interrupted, and all bounteous nature spreads an immense field of verdure for their support.

The elk is shy and retiring; having acute senses, he receives early warning of the approach of any human intruder.

* "The we-was-kish, or as some (though improperly) call it, the waskesse, is quite a different animal from the moose, being by no means so large in size. The horns of the wewaskish are *something similar* to those of the common deer [the *Rein Deer*; he distinguishes the common deer *C. Virginianus* (of the United States) as Indian deer,] but are *not palmated* in any part. They stand more upright, have fewer branches, and want the brow antler. The head of this animal is so far from being like that of the moose, that the nose is sharp like that of a sheep. The hair is usually of a sandy red, and they are frequently called by the English, (who visit the interior parts of the country, red deer. The person who informed Mr. PENNANT that the wewaskish and moose are the same animal, never saw one of them; and the only reason he had to suppose it, was the great resemblance of their skins." p. 360.

The moment the air is tainted by the odour of his enemy, his head is erected with spirit, his ears rapidly thrown in every direction to catch the sounds, and his large dark glistening eye expresses the most eager attention. Soon as the approaching hunter is fairly discovered, the elk bounds along for a few paces, as if trying his strength for flight, stops, turns half round, and scans his pursuer with a steady gaze, then, throwing back his lofty horns upon his neck, and projecting his taper nose forwards, he springs from the ground and advances with a velocity which soon leaves the object of his dread far out of sight.

But in the season when sexual passion reigns with its wonted influence over the animal creation, the elk, like various other creatures, assumes a more warlike and threatening character. He is neither so easily put to flight, nor can he be approached with impunity, although he may have been wounded. His horns and hoofs are then employed with great effect, and the lives of men and dogs are endangered by coming within his reach. This season is during August and September, when the horns are in perfect order, and the males appear filled with rage, and wage the fiercest war with each other for the possession of the females. During this season, the males are said to make a loud and unpleasant noise, which is compared to a sound between the neighing of a stallion and the bellowing of a bull. Towards the end of May or the beginning of June, the female brings forth her young, commonly one, but very frequently two in number, which are generally male and female.

The flesh of the elk is highly esteemed by the Indians and hunters as food, and the horns, while in their soft state, are also considered a delicacy: of their hides a great variety of articles of dress and usefulness are prepared. The solid portion or shaft of the perfect horn is wrought by the Indians into a bow, which is highly serviceable from its elasticity, as well as susceptible of beauty of polish and form. Several of these bows may be seen in the extensive collection of Indian implements belonging to the Philadelphia Museum.*

* In a work devoted to the natural history of our country, a passing tribute to the memory of one who has done much for natural science, will not, we hope, be regarded as obtrusive.

But a few weeks have elapsed since the great debt of nature was paid by CHARLES WILSON PEALE, the founder of the Philadelphia Museum. If a long life, devoted with singular enthusiasm to the advancement of natural history, by the collection of objects in all the departments of natural science, be meritorious; if the establishment of an institution which has long been the pride, and promises hereaf-

The elk has occasionally been to a certain degree domesticated, and might possibly be rendered as serviceable as the rein-deer. A pair of these animals, represented in London under the name of Wapiti, were trained to draw in harness, or to bear the saddle, for the amusement of visitors. But these experiments are not sufficient to lead us to conclude that the elk could be readily substituted for the rein-deer or horse.

With what little is known of this species from actual observation, several writers have mingled a great deal of fable, and have repeated the stories of "hunters" until they have at length passed for the truth. Thus we are told of "a small vesicle (on the outside of the elk's hind legs) that contains a thin unctuous matter, which some of our hunters call the "oil." Various improbable uses are assigned to this unique and wonderful "oil spring," which it would be lost time to repeat or refute. We have inquired of those who have dissected several of these animals, and have been present at the dissection of one ourselves, but have never been able to discover any thing of this "vesicle." A friend who had one of these animals for several years living in his possession, states, that he never detected the presence of any such apparatus or oil. Until better proof be given than has yet been offered, we shall feel willing to rank this story among the "conjectures" which have been too often resorted to when there was a scarcity or difficulty of obtaining "facts."

We have already adverted to the warlike disposition of the elk during a particular season, but it may not be amiss to add, that at all times this animal appears to be more ready to attack with his horns than any other species of deer we have examined. When at bay, and especially if slightly wounded,

ter to be an honour and ornament to our country, be valuable ; if eighty-six years spent with unblemished integrity and consistency of character in the service of his friends and country, be worthy of respect, the memory of this good man will long continue to be dear to those who are capable of admiring unostentatious virtue, and appreciating the benefits which have already resulted, and will continue to flow from his labours. To the last moment of his existence, he exemplified in the fullest degree the excellent effects of a temperate and industrious life ; and in the benevolence of his disposition, the undisturbed serenity of his mind, and the unimpaired vigour of his intellect, showed how far the study of nature, in her curious and wonderful works, had refined and ennobled a mind which owed nothing to early education. To him death presented no terrors, for he had long considered it as the termination of his toils ; he looked upon the grave but as the place in which he might yield his mortality to the beneficent source whence he sprung ; and at peace with all mankind, he gently breathed his last, in cheering confidence of the mercy of the Most high. May he rest in peace !

he fights with great eagerness, as if resolved to be revenged. The following instance from Long's Expedition to the Rocky Mountains will, in some degree, illustrate this statement.

A herd of twenty or thirty elk were seen at no great distance from the party, standing in the water or lying upon the sand beach. One of the finest bucks was singled out by a hunter, who fired upon him: whereupon the whole herd plunged into the thicket and disappeared. Relying upon the skill of the hunter, and confident that his shot was fatal, several of the party dismounted and pursued the elk into the woods, where the wounded buck was soon overtaken. Finding his pursuers close upon him, the elk turned furiously upon the foremost, who only saved himself by springing into a thicket, which was impassable to the elk, whose enormous antlers becoming so entangled in the vines as to be covered to their tips, he was held fast and blindfolded, and was despatched by repeated bullets and stabs.

SPECIES IV.—*The Black-tail Deer.*

Cervus Macrotis; SAY.

The Black-tailed Fallow Deer: LEWIS and CLARKE, i. p. 30. *Mule Deer*: *IBID.* ii. 166.

Cervus Auritus: WARDEN, *Descr. des Etats Unis*, v. 640.

Cervus Macrotis: SAY, *Long's Exped. to the Rocky Mountains*, ii. 88.

[*Commonly called Mule Deer.**]

The first indication of this fine deer was given by Lewis and Clarke, who found it upon the sea coast and the plains of the Missouri, as well as upon the borders of the Kooskoose river, in the vicinity of the rocky mountains. They inform us that the habits of this animal are similar to those of its kindred species, except that it does not run at full speed, but bounds along, raising every foot from the ground at the same time. It is found sometimes in the woodlands, but most frequently is met with in prairies and in open grounds. Its size is rather greater than that of the common deer, (*C. Virginianus*) but its flesh is considered inferior to the flesh of that species.

According to SAY's description, the horns are slightly grooved and tuberculated at base, having a small branch near the base, resembling in situation and direction the first branch

* We avoid this name because it leads to an incorrect notion of the animal. The resemblance of its ears to those of the mule gave origin to the name.

THE BLACK-TAIL DEER.

n of the common deer. The front line of the antler like that of the common deer, but not to so great a d at about the middle of the entire length of the ant- bifurcate equally, each of these processes again ear the extremity, the posterior being somewhat the

rs are very long, being half the length of the whole d extending to its principal bifurcation. The eye han that of the common deer, and the subocular si- larger. The hair is coarser, undulated and com- esembling that of the elk, (*C. Canadensis*) and is of dish brown colour above. The sides of the hair on of the nose is of a dull ash colour; that on the back tied with blackish tipped hairs, which form a dis- on the neck, near the head. The tail is of a pale h colour, except at the extremity on its superior sur- re it is of a jetty black; beneath it is white, yet stitute of hair. The hoofs are shorter and wider e of the common deer, and more like those of the

Following measurements are given by SAY in the work above





Virginia or Fallow Deer, Male.



Fallow Deer, Female.

C. A. Linné del.

E. Koenig sc.

SPECIES V.—*The Common Deer.**Cervus Virginianus.*

Fallow Deer: CATESBY, App. ii. 28: Lawson, Carol. 123.

Caricon Femelle: BUFF. 12, pl. 44.

Cerf de la Louisiane: C. Ossem. Foss. et Regne Anim. FRED. CUV.

Mummif, Lithogr. 4. fig.

Virginian Deer: PENNANT, Quad.

Cerf de Virginie: DESM. Mammal. sp. 679, p. 442.

The Common Deer is the smallest American species at present known, and is found throughout the country between Canada in the north and the banks of the Orinoco in South America. In various parts of this extensive range, considerable varieties in size and colouring are presented by this species, though these being accidental and mutable, require no especial description.

The common deer is more remarkable for general slenderness and delicacy of form, than for size and vigour. The slightness and length of its limbs, small body, long and slim neck, sustaining a narrow and almost pointed head, give the animal an air of feebleness, the impression of which is only to be counteracted by observing the animated eye, the agile and playful movements, and admirable celerity of its course when its full speed is exerted. Then all that can be imagined of grace and swiftness of motion, joined with strength sufficient to continue a long career, may be realized.

The common deer has always been of great importance to the aborigines of America, as an abundant source of food and raiment, nor has its value been less to the pioneers of civilization in their advances into the untrodden solitudes of the west. The improvements in agriculture have long since rendered this supply of food of comparatively little value to the white man, yet vast numbers of this species are annually destroyed, equally for the sake of their flesh, hides and horns. Judging by the quantity of skins brought to our markets, and calculating the average number of common deer destroyed during the time which has elapsed since the settlement of the country, we may form an imperfect notion of the aggregate number and productiveness of this species; which, notwithstanding this extensive consumption, does not appear to be very rapidly diminishing, if we except the immediate vicinities of very thickly peopled districts. Even in these, where the destruction of deer during the breeding season is prevented by law, the increase seems quite equal to the demand, and such humane and judicious provisions will probably preserve

this beautiful race to adorn the forest long after the species is exterminated in situations where it is not thus protected.

The common deer is possessed of keen senses, especially of hearing and smelling; the sight, though good, does not appear to equal in power the senses just named, upon which the safety of the animal most immediately depends.

It is therefore necessary for the hunter to approach the deer against the wind, otherwise he is discovered by the scent, at a great distance, and his objects are entirely frustrated. The slightest noise excites the attention of the deer, and his fears appear to be more readily awakened by this cause than any other; while on the contrary, the sight of unaccustomed objects seems rather to arouse curiosity than to produce terror, as the animal will frequently approach, or stand gazing intently, until the hunter steals close enough to fire with fatal aim.

The deer, in herds of various numbers, frequent the forests and plains adjacent to the rivers, feeding principally upon the buds and twigs of trees and shrubs, though they are fond of grass when their favourite food is not more convenient. The herd is led by one of the largest and strongest bucks, who appears to watch over the general safety, and leads the way on all occasions. When any cause of alarm checks their progress, the leader stamps with his feet, threatens with his horns, and snorts so loudly as to be heard for a very considerable distance. So long as he stands fast, or prepares for combat, the rest of the herd appear to feel secure; but when he gives way they all follow with precipitation, and vie with each other in the race.

The salines, or licks as they are commonly called, are eagerly sought for by these deer, as they have an equal fondness for salt with most other animals belonging to the same order. In licking the soil, through which the saline matter oozes to the surface, they take up very considerable quantities of the earthy matter, and this enables the hunter to discover when the deer have recently visited the spot, or that one of these places is not far distant, as the excrement of the animal then resembles small balls or pellets of hardened clay. The watchfulness of the leader of the herd, as above mentioned, has led the hunters to form an opinion, to which they pertinaciously adhere, that the deer, when they visit a salt lick, always post one of their number as a sentinel, who is to give the alarm in case of the approach of an enemy.

The common deer, when startled from a resting place without being much alarmed, moves at first in a singular and amusing manner. With an apparent awkwardness, two or three springs are made, from which the animal alights on three feet,

drawing up and extending the limbs in a stiff and peculiar manner. As the tail is erected, this alternate resting upon the feet of opposite sides, causes the tail to describe a semi-circle from side to side; a few high bounds are next made forwards, as if with a view to prepare for subsequent exertion, and then, if the cause of alarm be continued; the deer exerts his strength, and dashes off in his swiftest career.

Although the common deer is generally a very shy and timid animal, the males are very much disposed to war with each other during the season of their sexual passion, and they are almost always inclined to fight when wounded or brought to bay. At this time they fight with their fore feet as well as their horns, and inflict severe wounds by leaping forward and striking with the edges of their hoofs held together. If a hunter falls on the ground, in attempting to close in and despatch a wounded deer with his knife, he is in great danger of being killed by such blows as we have described. This deer is also said by the hunters to evince a very strong degree of animosity towards serpents, and especially to the rattlesnake, of which it has an instinctive horror. In order to destroy one of these creatures, the deer makes a bound into the air, and alights upon the snake with all four feet brought together in a square, and these violent blows are rapidly repeated until the hated reptile is destroyed. The combats in which the males engage with each other, are frequently destructive of the lives of both, in a way that would not readily be anticipated. In assaulting each other furiously, their horns come into contact, and being elastic, they yield mutually to the shock, so that the horns of one animal pass within those of the other, and thus secure them, front to front, in such a manner that neither can escape, and they torment themselves in fruitless struggles until worn down by hunger, they perish, or become the prey of wolves or other animals. Heads of deer which have thus perished are frequently found, and there is scarcely a museum in this country which has not one or more specimens. The following instance is given by SAY in Long's Expedition to the Rocky Mountains: "As the party were descending a ridge, their attention was called to an unusual noise proceeding from a copse of low bushes, a few rods from the path. On arriving at the spot, they found two buck deer, their horns fast interlocked with each other, and both much spent with fatigue, one in particular being so much exhausted as to be unable to stand. Perceiving that it would be impossible that they should extricate themselves, and must either linger in their present situations or die of hunger, or be destroyed by the wolves, they despatch-

ed them with their knives, after having made an unavailing attempt to disentangle them. Beyond doubt many of these animals must annually thus perish."

The common deer is fattest and in best condition in the months of October and November, when the rutting season commences, and continues about a month, terminating commonly about the middle of December. While this season continues, the neck of the male is enlarged or dilated.

The female commonly has one or two, and sometimes three* fawns, which are of a light cinnamon colour, spotted with white. While the fawns are still young, or from May until July, the doe very carefully conceals her offspring while she goes to feed; and this act of maternal fondness is not only done in a state of nature, but even when the common deer have been captive for some time and breed in parks. The hunters, however, turn this fondness to their own account, by imitating the cry of the fawn, either by the voice alone, or by a sort of pipe or reed, which closely resembles the bleating of the animal. The parent soon relinquishes all fears for her own safety, in her desire to assist her offspring, and following the sound, approaches the ambush of the hunter, where a deadly shot insures her immediate destruction. When a doe is killed, in company with her fawn, or the mother has been removed as above mentioned, the little animal is at once tamed, or exhibits no apprehension at the approach of man, but follows his captive with the most confiding simplicity, and soon becomes so attached to his feeder as to attend his steps at all times, and obey his voice.†

In the latter part of the summer, the fawn loses the white spots, and in winter the hair grows longer and grayish, when the animal is said by the hunters to be *in the gray*. To this coat, one of a reddish colour succeeds about the end of May and beginning of June; the deer is then said to be *in the red*. Towards the end of August, the old bucks begin to change to the dark bluish colour; the doe begins this change a

* "About the middle of March, Mr. Peale shot a large doe, in the matrix of which were three perfectly formed young, of the size of rabbits." Long's Exped. to the Rocky Mountains, i.

† "From Capt. Parry, I learn an interesting anecdote of a doe and her fawn, which he had pursued across a small inlet. The mother, finding her young one could not swim so fast as herself, was observed to stop repeatedly, so as to allow the fawn to come up with her, and having landed first, stood watching it with trembling anxiety, as the boat chased it to the shore. She was repeatedly fired at, but remained immovable, until her offspring landed in safety, when they both cantered out of sight."—*Lyon's Narrative*, p. 80.

week or two later, when they are said to be *in the blue*. This coat gradually lengthens until it finally returns to the gray. The skin is said to be toughest in the red, thickest in the blue, and thinnest in the gray; the blue skin is most valuable.*

In the month of January, the males cast their horns; the new horns soon after commence their growth. They continue in the velvet until the end of September or beginning of October, so as to be in full condition for battle during their season of love and war. These horns are not very large, but are curved forwards in a peculiar manner. They have an antler placed high up on the inside of each shaft, which presents downwards, and two or three others on the posterior surface turning backwards. In the fifth year, the horns consist of two cylindrical, whitish, and moderately smooth shafts, separating at first slightly outwards and backwards, and then strongly curving forwards and downwards. From the second to the fifth year the variations of the horns consist in their gradual advance from single, slightly curved shoots, to three and four antlers.

From what has been already said of the changes occurring at different seasons, it will be perceived that no description of the pelage of any one can be generally applicable. It may be stated that the colour of the adults in summer is a fine fawn or yellowish brown above, with the under part of the lower jaw, throat, belly, lower part of the limbs, posterior edges of the fore-limbs, anterior part of the thighs, and inferior surface of the tail, white. The front is rather gray, while the end of the muzzle is of a deep brown, with two white spots upon the upper lip; on the sides of the lower jaw, at the angles of the mouth, two triangular black spots are very generally found. Two-thirds of the upper surface of the tail is light brown, the outer third is black.

The total length of the common deer, exclusive of the hair at the tip of the tail, is five feet four or five inches. The tail, exclusive of the hair, is nine inches and a half long. The hind foot from the tip of the oss calcis to the extremity of the toe, is sixteen inches and a quarter. The fore arm eleven inches and seven eighths. The weight in the month of February, was 115 lbs.†

During the stay of Long's Expedition at Engineer cantonment three specimens of a variety of the common deer were

* See SAY, in Long's Expedition to the Rocky Mountains, i. p. 104.

† SAY. Lewis and Clarke state that they saw common deer with tails seventeen inches in length.

The skins of the common deer continue to form a very valuable article of commerce, and furnish a material better suited for the manufacture of gloves, and various articles of dress, than the skin of any other animal with which we are acquainted. The Indian fashion of dressing the skins consists in depriving them of the hair and fleshy matter, and rubbing them sedulously with a lather made of the brains of the animal until they become uniformly soft, spongy and flexible. In this condition they impart to the touch a sensation of greater softness than that derived from the finest cloth. Deer skins dressed in this way, however, are very liable to be spoiled by moisture, and rot with great rapidity if they continue for some time exposed to rain.

The buck-skin, as dressed for the use of our gloves, is remarkable for its thickness, softness and pliability, and with these advantages it has the great superiority of not being liable to injury from moisture, as tannin is made use of in its preparation. In relation to its warmth, durability and agreeableness to the wearer, it appears to be much preferred to similar leather made from any other skins, whether of European or American deer. Within a few years past the use of buckskin shirts has very much increased among invalids, and often with great advantage. But it is generally believed that these shirts render the body extremely susceptible to changes of temperature, and, all things considered, do more injury than shirts made of flannel or other commonly used materials.

tribes of Indians in those parts, both northern and southern, is blood, mixed with the half digested food found in the deer's stomach or paunch, and boiled up with a sufficient quantity of water to make it of the consistence of pease pottage. Some fat and scraps of tender flesh are also shred small and boiled with it. To render this dish more palatable, they have a method of mixing the blood with the contents of the stomach in the paunch itself, and hanging it up in the heat and smoke of the fire for several days, which puts the whole mass in a state of fermentation, and gives it such an agreeable acid taste, that, were it not for prejudice, it might be eaten by those who have the nicest palates."—**HEARNE, 317.**



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1. The Mountain Goat 2. Pronghorn Antelope

CHAPTER X.

GENUS V.—ANTELOPE; *Antelope*. PALL. &c. &c.

Fr. Antilope.

Gr. Antelope.

GENERIC CHARACTERS.

THE body, ears, eyes and lachrymal or subocular sinuses, are very similar to those of the deer, and the limbs bear an equal resemblance thereto, except that some species of antelope have tufts or brushes of long hair pending from the carpus. The outline of the front or face is nearly straight, and terminates in a muzzle, or half muzzle, though in some species this is absent. The teats are four or two in number, being sometimes two in one sex and four in the other. The gall bladder is uniformly present, a circumstance in which this genus differs remarkably from the deer.

The horns of both sexes (though in some species the horns are confined to the male) are placed upon a solid bony process of the os frontis. The horns are curved in various directions, being often marked with transverse bands, have a salient spiral line, or are bifurcated.

Dental System.

$$32 \text{ Teeth : } \left\{ \begin{array}{ll} 12 \text{ Upper} & \left\{ \begin{array}{l} 0 \text{ Incisive} \\ 12 \text{ Molar.} \end{array} \right. \\ 20 \text{ Lower} & \left\{ \begin{array}{l} 8 \text{ Incisive} \\ 12 \text{ Molar.} \end{array} \right. \end{array} \right.$$

SPECIES I.—*The Prong-Horn Antelope.*

Antelope Americana; ORD.

Antelope: LEWIS and CLARKE, i. 75, 208, 369; ii. 169.

Antelope Americana: ORD. GUTHRIE's Geography, Philad. ed. 1815.

Antilocapra Americana: IBID. Journal. de Physique, 1818. SAY.

Long's Exped. to the Rocky Mountains, i. 363, 465.

Antelope Furcifer: SMITH. Trans. of Linnæan Society, xiii. pl. 2.

Prong-Horned Antelope: SAB. App. p. 667.

Our adventurous countrymen who led the first expedition across the Rocky Mountains, were the first to call attention to this beautiful animal, and the first to call it by its true name.

Notwithstanding the obviousness of all the other characters, the circumstance of its having an offset, or prong to its horns, kept *nomenclators* for years undecided as to what place it should occupy in their arrangements, and gave them an opportunity, by which they have not failed to profit, of multiplying *words* and *republishing* their own names, if they made no addition to our information on the subject. All that has been related concerning this animal which is worth repeating or remembering, was published in Lewis and Clarke's narrative, above quoted, and has since been confirmed by the observations of Dr. Richardson, appended to Franklin's Journey to the shores of the Polar Sea. Leaving to the nomenclators their disputations about what Dekay has happily called 'the barren honors of a synonyme,' we shall glean the few facts contained in the narrations of the above-mentioned accurate observers of nature.

The prong-horn antelope is an animal of wonderful fleetness, and so shy and timorous as but seldom to repose, except on ridges which command a view of the surrounding country. The acuteness of their sight and the exquisite delicacy of their smell, render it exceedingly difficult to approach them; and when once danger is perceived, the celerity with which the ground is passed over appears to the spectator to resemble the flight of a bird rather than the motion of a quadruped.

In one instance Capt. Lewis, after various fruitless attempts by winding around the ridges, succeeded in approaching a party of seven that stood upon an eminence towards which the wind was unfortunately blowing. The only male of the party frequently encircled the summit of the hill, as if to announce any danger to the groupe of females which stood upon the top. Before they saw Capt. Lewis, they became alarmed by the scent, and fled while he was at the distance of two hundred yards. He immediately ran to the spot where they had stood; a ravine concealed them from him, but at the next moment they appeared on the second ridge, at the distance of three miles. He could not but doubt whether these were the same he had alarmed, but their number and continued speed, convinced him they were so, and he justly infers that they must have run with a rapidity equal to that of the most celebrated race horse.

Yet, notwithstanding the keenness of their senses, and surprising velocity of their course, the prong-horn antelope is often betrayed to his destruction by curiosity. When the hunter first comes in sight, his whole speed is exerted, but if his pursuer lies down, and lifts up his hat, arm or foot, the antelope trots back to gaze at the object, and sometimes goes

and returns two or three times, until it comes within the reach of the rifle. This same curiosity occasionally enables the wolves to make them a prey; for sometimes one of them will leave his companions, to go and look at the wolves, which, should the antelope be frightened at first, crouch down, repeating the manœuvre, sometimes relieving each other, until they succeed in decoying it within their power, when it is pulled down and devoured. But the wolves more frequently succeed in taking the antelopes when they are crossing the rivers, as they are not good swimmers.

"The chief game of the Shoshonees," says Lewis and Clarke, "is the antelope, which when pursued, retreats to the open plains, where the horses have full room for the chase. But such is its extraordinary fleetness and wind, that a single horse has no possible chance of outrunning it, or tiring it down; and the hunters are therefore obliged to resort to stratagem. About twenty Indians, mounted on fine horses, armed with bows and arrows, left the camp; in a short time they descried a herd of ten antelopes: they immediately separated into squads of two or three, and formed a scattered circle round the herd, for five or six miles, keeping at a wary distance, so as not to alarm them till they were perfectly inclosed, and usually selecting some commanding eminence as a stand. Having gained their positions, a small party rode towards the herd, and with wonderful dexterity the huntsman preserved his seat, and the horse his footing, as he ran at full speed over the hills and down the steep ravines, and along the borders of the precipices. They were soon outstripped by the antelopes, which, on gaining the other extremity of the circle, were driven back and pursued by the fresh hunters. They turned and flew, rather than ran, in another direction; but there too they found new enemies. In this way they were alternately pursued backwards and forwards, till at length, notwithstanding the skill of the hunters, (who were merely armed with bows and arrows,) they all escaped; and the party, after running for two hours, returned without having caught any thing, and their horses foaming with sweat. This chase, the greater part of which was seen from the camp, formed a beautiful scene, but to the hunters is exceedingly laborious, and so unproductive, even when they are able to worry the animal down and shoot him, that forty or fifty hunters will sometimes be engaged for more than half a day, without obtaining more than two or three antelopes."

The prong-horn is found in the vicinity of Carlton House during the summer, and is usually called a *goat* by the Canadians. The Creek Indians call them *apestachoekees*. Lewis

and Clarke saw the animal very frequently during their journey to the mouth of the Columbia River, though they were fewer on the plains of Columbia than on the eastern side of the Rocky Mountains.

Great numbers of these animals were seen by Lewis and Clarke, in the month of October, near Carp Island, in the Missouri, where large flocks of them were driven into the water by the Indians. The men were ranged along the shore so as to prevent the escape of the antelopes, and fired upon them, and sometimes the boys went into the river and killed them with sticks. Fifty-eight of the antelopes were killed by the Indians during the time they were observed by our travellers. They were then migrating from the plains east of the Missouri, where they spend the summer, towards the mountains, where they subsist on leaves and shrubbery, during the winter: in the spring they resume their migrations.

The Mandan Indians capture the prong-horn antelopes by means of a pound similar to that described in the account of the rein-deer.

The following description is given by Dr. Richardson, from a recent specimen:—"The male is furnished with short, black, roundish, tapering horns, arched inwards, turning towards each other, with their points directed backwards, each horn having a single short branchlet projecting from the middle. The winter coat consists of coarse, round, hollow hairs, like those of the moose. The neck, back, and legs are yellowish brown; the sides are reddish white; the belly and chest are white, with three white bands across the throat. The hairs on the occiput and back of the neck are long and tipped with black, forming a short erect mane. There is a black spot behind each cheek, which exhales a strong goat-like odour. The tail is short; on the rump there is a large spot of pure white. The dimensions of the animal were as follows:—from the nose to the root of the tail, four feet; height of the fore shoulder, three feet; that of the hind quarter, the same. Girth behind the fore legs, three feet; girth before the fore legs, two feet ten inches. The female is smaller than the male, having straighter horns, with rather a protuberance than a prong. She is also deficient in the black about the neck.

GENUS VI. GOAT; *Capra*, L.

Fr. Chèvre.

Germ. Ziege.

GENERIC CHARACTERS.

The outline of the front is rather straight, or slightly concave; there is no muzzle nor sub-ocular sinuses; the interspace of the nostrils is naked; the horns are turned upwards and outwards. The body is slender, the tail short, and the limbs somewhat robust. The teats are two in number. The hair is of two sorts; the exterior is long, or very long and smooth, forming a beard beneath the chin. Sometimes there are cuticular appendages hanging from the inferior surface of the neck. The testes are contained in a very large scrotum.

Dental System.

32 Teeth :	{ 12 Upper	{ 12 Molar.
	{ 20 Lower	{ 8 Incisive. 12 Molar.

SPECIES I.—*Rocky Mountain Goat*.*Capra Montana*; ORD.

Ovis Montana: ORD. GUTHRIE'S Geography, Philad. ed. 292, 309. *IBID.* Journ. Acad. Nat. Sciences, i. part 1. p. 8
Rupicapra Americana: BLAINVILLE. *Antelope Americana*: *IBID.* Bullet. de la Société Philomathique, p. 80.
Antelope Lanigera: SMITH, Trans. Linnæan Society, xiii. pl. 4.

[Commonly called *Rocky Mountain Sheep*.]

This animal concerning which very little is known, is stated by Major LONG, in his communication to the Philadelphia Agricultural Society, to inhabit the portion of the Rocky Mountains situated between the forty-eighth and sixty-eighth parallels of north latitude. By Lewis and Clarke it was observed as low as forty-five degrees north. They are in great numbers about the head waters of the north fork of Columbia river, where they furnish a principal part of the food of the natives. They also inhabit the country about the sources of Marais or Muddy River, the Saskatchewan and Athabasca. They are more numerous on the western than on the eastern slope of the Rocky Mountains, but are very rarely seen at any distance from the mountains, where they appear to be better suited to live than elsewhere. They frequent the peaks and ridges during

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er, and occupy the valleys in winter. They are obtained by the hunters but their flesh is not much valued, musty and unpleasant; neither do the traders consider it of much worth. The skin is very thick and spungy, principally used for the purpose of making moccasins. Rocky Mountain goat is nearly the size of a common sheep and has a shaggy appearance in consequence of the length of the long hair beyond the wool, which is white. Their horns are five inches long and one in diameter, slightly curved backward, and projecting but little beyond the wool of the head. The horns and hoofs are black. The first indication of this animal was given by Lewis and Clark, and it is much to be regretted that so little is still known of the manners and habits of this species. The only specimen preserved entire, that we know of, is that figured by Pennant in the Linnæan Transactions, from which the figure in this plate is taken. The fineness of the wool of this animal possibly hereafter induce persons who have it in their power to make some exertions to introduce this species among domestic animals. It is said that the fleece of this goat is as fine as that of the celebrated shawl goat of Cashmere.

Feder. del.

Capra, v. Mado, v. Hondo.



J. Koenig sc.



SPECIES I.—*The Argali.**Ovis Ammon*: L.

Ovis fera Sibirica: vulgo, Argali dicta; PALL. Spicil. Zool. fasc. xi. pl. 1
Monflor Argali: SHAW, Gen. Zool. ii. part 2. pl. 201.
Ovis Montana: GEOFF. Ann. du Mus. ii. pl. 60.
Big Horn: LEWIS and CLARKE, i. 144.
Monflor D'Amérique: DESM. Man.

The Argali is found in Northern Asia, and Eastern Siberia, whence it appears gradually to have passed into North America by crossing the ice, where the continents are separated but by a narrow strait. In America it inhabits the Rocky Mountains, in about the fiftieth degree of north latitude, and extends along the Rocky Mountain range into California. In these mountains the Argali are seen in troops containing twenty or thirty, feeding upon the most precipitous parts of the ground, and leaping with wonderful activity, and at great distances, from rock to rock.

The spring of the year and autumn are said to be the sexual seasons of this species, during which period the males acquire the same disposition to fight with each other as we have described in treating of the deer.

Two specimens of the argali, a male and female, were brought in by Lewis and Clarke, and may be seen in the Philadelphia Museum, where they are preserved. The engraving will give a good idea of these animals, though the specimens just mentioned, from which the drawing was made, are much injured by time and exposure to the dust.

The male has very large horns, which arise quite near to the eyes, curve at first backwards, then bend forwards, and have their points turning upwards and outwards. These horns are triangular at the lower part, have their broadest surface forwards, and are deeply wrinkled thence for the half of their length; the superior part is smoother. The ears are straight, broad and pointed. The tail is quite short.

The colour of the argali, during summer, is of a grayish fawn, generally having along the back a deeper yellow or reddish line. Around the root of the tail, upon the buttocks, there is a spot of the same colour. The belly and inner surface of the limbs have a pale brownish or dirty white colour. The winter pelage is of a deeper reddish tint above, while the mouth, and under part of the throat and belly, are nearly white.

The horns of the female are slender, when compared with those of the male, being almost straight and little wrinkled.

The dimensions of a large male killed by Mr. M'Gillivray
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were these :*—from the nose to the base of the tail
length of the tail four inches ; girth of the body four
height of the body three feet eight inches. The horn
feet and a half long, and was one foot three inches
reference at base.

much to be regretted that we are not better acquainted
peculiar history of this animal, drawn up by some one
studied it in its native wilds ; more especially as this
is said to be the source whence all the varieties of our
sheep are descended, an opinion which the form and
parts of its body seem to confirm, but one which would
be imagined, if we relied upon the condition of the
tool by which the wild animal is covered.

is paper in the New York Medical Repository, vol. vi. 238.





Common Ox.



Bison.

CHAPTER XI.

GENUS OX; *Bos*; L.

Fr. Bœuf.
Sp. Bully.

Germ. Ochs.
Ital. Bove.

GENERIC CHARACTERS.

THE head is large, having a straight outline; large ears and eyes; a large muzzle and long smooth tongue. The subocular sinuses do not exist. The body is of large size, supported upon strong legs. A fold of skin depends below the neck, called the dewlap. The tail is frequently long and terminates in a brush; in some species it is of a middling length. The horns are conical, smooth and simple, variously curved, though often turned laterally with the points upwards.

Dental System.

32 Teeth:	{	12 Upper	{	12 Molar.
		20 Lower	{	8 Incisive
			{	12 Molar.

SPECIES I.—*The Bison.*

Bos Americanus; GMEL.

Taurus Mexicanus: HERNAND. Mex. 587. *Tauri Vaccasque*, *IBID.* Anim. p. 10.

The Buffalo: CATESBY, Carol. 28, tab. 20.

Bœuf Sauvage: DUPEATZ, Louisiane, ii. 66.

American Bull: PENN. Quad. pl. ii. fig. 2.

[Commonly Called *Buffaloe*.]

From other species of the ox kind, the Bison is well distinguished by the following peculiarities. A long shaggy hair clothes the fore part of the body, forming a well marked beard beneath the lower jaw, and descending behind the knee in a tuft. This hair rises on the top of the head in a dense mass, nearly as high as the extremities of the horns. Over the forehead it is closely curled, and matted so thickly as to deaden the force of a rifle ball, which either rebounds, or lodges

in the hair, merely causing the animal to shake his head as he heavily bounds along.

The head of the bison is large and ponderous, compared to the size of the body ; so that the muscles for its support, necessarily of great size, give great thickness to the neck, and by their origin from the prolonged dorsal vertebral processes form the peculiar projection called the *hump*. This hump is of an oblong form, diminishing in height as it recedes, so as to give considerable obliquity to the line of the back.

The eye of the bison is small, black, and brilliant ; the horns are black and very thick near the head, whence they curve upwards and outwards, rapidly tapering towards their points. The outline of the face is somewhat convexly curved, and the upper lip, on each side being papillous within, dilates and extends downwards, giving a very oblique appearance to the lateral gap of the mouth, in this particular resembling the ancient architectural bas-reliefs representing the heads of oxen.

The physiognomy of the bison is menacing and ferocious, and no one can see this formidable animal in his native wilds, for the first time, without feeling inclined to attend immediately to his personal safety. The summer coat of the bison, differs from his winter dress, rather by difference of length than by other particulars. In summer, from the shoulders backwards, the hinder parts of the animal are all covered with a very short fine hair, that is as smooth and as soft to the touch as velvet. The tail is quite short and tufted at the end, and its utility as a fly-brush is necessarily very limited. The colour of the hair is uniformly dun, but the long hair on the anterior parts of the body is to a certain extent tinged with yellowish or rust colour. These animals, however, present so little variety in regard to colour, that the natives consider any remarkable difference from the common appearance as resulting from the immediate interference of the Great Spirit.

Some varieties of colour have been observed, although the instances are rare. A Missouri trader informed the members of Long's exploring party, that he had seen a grayish white bison, and a yearling calf, that was distinguished by several white spots on the side, a star or blaze in the forehead, and white fore feet. Mr. J. Doughty, an interpreter to the expedition, saw in an Indian hut a very well prepared bison head, with a star on the front. This was highly prized by the proprietor, who called it his *great medicine*, for, said he, "the herds come every season to the vicinity to seek their white faced companion."

In appearance, the bison cow bears the same relation to the bull that is borne by the domestic cow to her mate. Her



C. A. Leconte del.

E. Kaup sculp.



size is much smaller, and she has much less hair on the fore part of her body. The horns of the cow are much less than those of the bull, nor are they so much concealed by the hair. The cow is by no means destitute of beard, but though she possesses this conspicuous appendage, it is quite short when compared with that of her companion.

From July to the latter part of December, the bison cow continues fat. Their breeding season begins towards the latter part of July, and continues until the beginning of September, and after this month, the cows separate from the bulls in distinct herds, and bring forth their calves in April. The calves rarely separate from the mother before they are one year old, and cows are frequently seen accompanied by calves of three seasons.

The flesh of the bison is somewhat coarser in its fibre than that of the domestic ox, yet travellers are unanimous in considering it equally savory as an article of food; we must, however, receive the opinions of travellers on this subject with some allowance for their peculiar situations, being frequently at a distance from all other food, and having their relish improved by the best of all possible recommendations in favour of the present viands—hunger. It is with reason, however, that the flesh is stated to be more agreeably sapid, as the grass upon which these animals feed is short, firm and nutritious, being very different from the luxuriant and less saline grass produced on a more fertile soil. The fat of the bison is said to be far sweeter and richer, and generally preferable to that of the common ox. The observations made in relation to the bison's flesh, when compared with the flesh of the domestic ox, may be extended to almost all wild meat, which has a peculiar flavour and raciness that renders it decidedly more agreeable than that of tame animals, although the texture of the flesh may be much coarser and the fibre by no means as delicate.

Of all the parts of the bison that are eaten, the hump is the most famed for its peculiar richness and delicacy; because when cooked, it is said very much to resemble marrow. The Indian mode of cooking the hump is to cut it out from the vertebræ, after which the spines of bone are taken out, the denuded portion is then covered with skin, which is finally sewed to the skin covering the hump. The hair is then singed and pulled off, and the whole mass is put in a hole dug in the earth for its reception, which has been previously heated by a strong fire in and over it the evening previous to the day on which it is to be eaten. It is then covered with cinders and earth about a foot deep, and a strong fire made over it. By

the next day at noon, it is fit for use. The tongues and marrow bones are also highly esteemed by the hunters. To preserve the flesh for future use, the hunters and Indians cut it into thin slices and dry it in the open air, which is called *jerk-ing*; this process is speedily finished, and a large stock of meat may thus be kept for a considerable length of time.

From the dried flesh of the bison the fur traders of the north-west prepare a food which is very valuable on account of the time it may be preserved without spoiling, though it will not appear very alluring to those who reside where provisions are obtained without difficulty. The dried bison's flesh is placed on skins and pounded with stones until sufficiently pulverized. It is then separated as much as possible from impurities, and one-third of its weight of melted tallow of the animal is poured over it. This substance is called *pemmican*, and being packed firmly in bags of skin of a convenient size for transportation, may be kept for one year without much difficulty, and with great care, perhaps two years.

During the months of August and September the flesh of the bison bull is poor and disagreeably flavoured; they are however much more easily killed, as they are not so vigilant as the cows, and sometimes allow the hunter to come up with them without much difficulty. Lewis and Clarke relate that once approaching a large herd, the bulls would scarcely move out of their way, and as they came near, the animals would merely look at them for a moment, as at something new, and then quietly resume their grazing.

The general appearance of the bison is by no means attractive or prepossessing, his huge and shapeless form being altogether devoid of grace and beauty. His gait is awkward and cumbersome, although his great strength enables him to run with very considerable speed over plains in summer, or in winter to plunge expeditiously through the snow.

The sense of smelling is remarkably acute in this animal, and it is remarked by hunters that the odour of the white man is far more terrifying to them than that of the Indian. From the neighbourhood of white settlements they speedily disappear: this, however, is very justly accounted for by Mr. SAY, who attributes it to the impolitic and exterminating warfare which the white man wages against all unsubdued animals within his reach.

As an exemplification of the peculiar strength of their sense of smelling, we may here relate a circumstance mentioned by Mr. SAY, in that valuable and highly interesting work, *Long's Expedition to the Rocky Mountains*, to which we are under continual obligations. These we are the more happy to ac-

knowledge, because we are well acquainted with the solicitude of the gentlemen composing that expedition to diffuse, as widely as possible, the knowledge of American Natural History.

The exploring party were riding through a dreary and uninteresting country, which at that time was enlivened by vast numbers of bisons, who were moving, in countless thousands, in every direction. As the wind was blowing fresh from the south, the scent of the party was wafted directly across the river Platte, and through a distance of eight or ten miles, every step of its progress was distinctly marked by the terror and consternation it produced among the bisons. The instant their atmosphere was infected by the tainted gale, they ran as violently as if closely pursued by mounted hunters, and instead of fleeing from the danger, they turned their heads towards the wind, eager to escape this terrifying odour. They dashed obliquely forwards towards the party, and plunging into the river, swam, waded, and ran with headlong violence, in several instances breaking through the expedition's line of march, which was immediately along the left branch of the Platte. One of the party, (Mr. SAY himself,) perceiving from the direction taken by the bull who led the extended column, that he would emerge from the low river bottom at a point where the precipitous bank was deeply worn by much travelling, urged his horse rapidly forward, that he might reach this station in order to gain a nearer view of these interesting animals. He had but just reached the spot when the formidable leader bounding up the steep, gained the summit of the bank with his fore feet, and in this position suddenly halted from his full career, and fiercely glared at the horse which stood full in his path. The horse was panick-struck by this sudden apparition, trembled violently from fear, and would have wheeled and taken to flight, had not his rider exerted his utmost strength to restrain him; he recoiled, however, a few feet and sunk down upon his hams. The bison halted for a moment, but urged forward by the irresistible pressure of the moving column behind, he rushed onward by the half-sitting horse. The herd then came swiftly on, crowding up the narrow defile. The party had now reached the spot, and extended along a considerable distance; the bisons ran in a confused manner, in various directions, to gain the distant bluffs, and numbers were compelled to pass through the line of march. This scene added to the plunging and roaring of those who were yet crossing the river, produced a grand effect, that was heightened by the fire opened on them by the hunters.

To the Indians and visitors of the western regions the bison is almost invaluable; we have mentioned that they supply a

large part of the food used by the natives, and covering to their tents and persons, while in many parts of the country there is no fuel to be obtained but the dried dung of this animal. The Indians always associate ideas of enjoyment with plenty of bison, and they frequently constitute the skull of one of them their "Great Medicine." They have dances and ceremonies that are observed previous to the commencement of their hunting.

The herds of bison wander over the country in search of food, usually led by a bull most remarkable for strength and fierceness. While feeding, they are often scattered over a great extent of country, but when they move in mass they form a dense, almost impenetrable column, which, once in motion, is scarcely to be impeded. Their line of march is seldom interrupted even by considerable rivers, across which they swim without fear or hesitation, nearly in the order that they traverse the plains. When flying before their pursuers, it would be in vain for the foremost to halt or attempt to obstruct the progress of the main body, as the throng in the rear still rushing onward, the leaders must advance, although destruction awaits the movement. The Indians take advantage of this circumstance to destroy great quantities of this favourite game, and, certainly, no mode could be resorted to more effectually destructive, nor could a more terrible devastation be produced, than that of forcing a numerous herd of these large animals to leap together from the brink of a dreadful precipice, upon a rocky and broken surface, a hundred feet below.

When the Indians determine to destroy bison in this way, one of their swiftest footed and most active young men is selected, who is disguised in a bison skin, having the head, ears, and horns adjusted on his own head, so as to make the deception very complete, and thus accoutred, he stations himself between the bison herd and some of the precipices, that often extend for several miles along the rivers. The Indians surround the herd as nearly as possible, when, at a given signal, they show themselves and rush forward with loud yells. The animals being alarmed, and seeing no way open but in the direction of the disguised Indian, run towards him, and he, taking to flight, dashes on to the precipice, where he suddenly secures himself in some previously ascertained crevice. The foremost of the herd arrives at the brink—there is no possibility of retreat, no chance of escape: the foremost may for an instant shrink with terror, but the crowd behind, who are terrified by the approaching hunters, rush forward with increasing impetuosity, and the aggregated force hurls them successively into the gulf, where certain death awaits them.

It is extremely fortunate that this sanguinary and wasteful method of killing bisons is not very frequently resorted to by the savages, or we might expect these animals in a few years to become almost entirely extinct. The waste is not the only unpleasant circumstance consequent on it; the air for a long time after is filled with the horrible stench arising from the putrefying carcasses not consumed by the Indians after such an extensive and indiscriminate slaughter. For a very considerable time after such an event, the wolves and vultures feast sumptuously and fatten to tameness on the disgusting remains, becoming so gentle and fearless, as to allow themselves to be approached by the human species, and even to be knocked down with a stick, near places where such sacrifices of bison have been made. Lewis and Clarke bestowed the name of *Slaughter River* on one of the tributaries of the Mississippi, in consequence of the precipices along its sides having been used by the Indians for this mode of killing the bison.

A better and more common way of killing bison is that of attacking them on horseback. The Indians, mounted and well armed with bows and arrows, encircle the herd and gradually drive them into a situation favourable to the employment of the horse. They then ride in and single out one, generally a female, and following her as closely as possible, wound her with arrows until the mortal blow is given, when they go in pursuit of others until their quivers are exhausted. Should a wounded bison attack the hunter, he escapes by the agility of his horse, which is usually well trained for the purpose.—In some parts of the country, the hunter is exposed to a considerable danger of falling, in consequence of the numerous holes made in the plains by the badger.

When the hunting is ended and a sufficiency of game killed, the squaws come up from the rear to skin and dress the meat, a business in which they have acquired a great degree of dexterity, as they can, with very inferior instruments, butcher a bison with far more celerity and precision than the white hunters.

If a bison is found dead, without an arrow in the body, or any particular mark attached, it becomes the property of the finder, so that a hunter may expend his arrows to no purpose when they fall off, after wounding or fairly perforating the animal. That the Indians do frequently send their arrows through the body of this animal is well attested by a great number of witnesses. In Long's expedition to the sources of St. Peter's river, it is related that Wahnita, a distinguished chief of the Sioux, has been seen to drive his arrow through the body of

one bison, and sufficiently deep into the body of a second to inflict a deadly wound.

When the ice is breaking up on the rivers in the spring of the year, the dry grass of the surrounding plains is set on fire, and the bison are tempted to cross the river in search of the young grass that immediately succeeds the burning of the old. In the attempt to cross, the bison is often insulated on a large cake of ice that floats down the river. The savages select the most favourable points for attack, and as the bison approaches, the Indians leap with wonderful agility over the frozen ice to attack him, and as the animal is necessarily unsteady, and his footing very insecure on the ice, he soon receives his death wound and is drawn triumphantly to the shore.

The Creek Indians make a bison-pound by fencing a circular space of about a hundred yards in diameter. The entrance is banked up with snow sufficiently high to prevent the animals from retreating after they have once entered. For about a mile on each side of the road leading to the pound, stakes are driven into the ground at nearly equal distances of about twenty yards, which are intended to look like men, and to deter the animals from endeavouring to break through the fence. Within fifty or sixty yards of the pound, branches of trees are placed between the stakes to screen the Indians who lie down behind them, to wait for the approach of the bison. The mounted hunters display the greatest dexterity in this sort of chase, as they are obliged to manœuvre around the herd in the plains so as to urge them in the road-way, which is about a quarter of a mile broad. When this is effected, the Indians raise loud shouts, and pressing closely on the animals, terrify them so much, that they rush heedlessly forwards towards the snare. When they have advanced as far as the men who are lying in ambush, they also show themselves, increasing the consternation of the bison by shouting violently and firing their guns. The affrighted animals have no alternative but to rush directly into the pound, where they are quickly despatched by guns or arrows. In the centre of one of these pounds there was a tree on which the Indians had hung strips of bison flesh and pieces of cloth, as tributary or grateful offerings to the Great Master of life. They occasionally place a man in the tree to sing to the presiding spirit as the bison advance. He is obliged to remain there until all the animals that have entered the pound are killed.*

* See Franklin's Exp. p. 112.

The Omawhaw Indians hunt the bison in the following manner. The hunters who are in advance of the main body on the march, employ telegraphic signals from an elevated position, to convey a knowledge of their discoveries to the people. If they see bisons, they throw up their robes in a peculiar manner as a signal for a halt. The hunters then return as speedily as possible to camp, and are received with some ceremony on their approach. The chiefs and magicians are seated in front of the people, puffing smoke from their pipes, and thanking the Master of life with such expressions as—"Thanks, Master of life, thank you Master of life, here is smoke; I am poor, hungry, and want to eat." The hunters then draw near the chiefs and magicians, and in a low tone of voice inform them of their discovery; when questioned as to the number, they reply by holding up some small sticks in a horizontal direction, and compare one herd at a certain distance with this stick, and another with that, &c.

An old man or crier then harangues the people, informing them of the company, exhorting the women to keep a good heart, telling them that they have endured many hardships with fortitude, and that their present difficulties are ended, as on the morrow the men will go in pursuit of the bisons and bring them certainly a plenty of meat.

Four or five resolute warriors are appointed at the council of chiefs, held the evening previous, to preserve order among the hunters, on the following day. It is their business, with a whip or club, to punish those who misbehave, on the spot, or whose movements tend to frighten the game before all are ready, or previously to their arrival at the place whence they are to sally forth.

The next morning all the men, not superannuated, depart at an early hour, generally mounted and armed with bows and arrows. The superintendants or officers abovementioned, accompany the swiftly moving cavalcade on foot, armed with war clubs, the whole preceded by a footman bearing a pipe. When they come in sight of the herd, the hunters talk kindly to their horses, using the endearing names of father, brother, uncle, &c. begging them not to fear the bisons, but to run well and keep close, taking care at the same time not to be gored by them.

Having approached the herd as closely as they suppose the animal will permit without alarm, they halt, that the pipe bearer may perform the ceremony of smoking, which is thought necessary to success. The pipe is lighted, and he remains a short time with his head inclined, and the stem of the pipe extended towards the herd. He then puffs the smoke towards the bisons, the heavens, the earth, and the cardinal

points successively. These latter are distinguished by the terms sun-rise, sun-set, cold country, and warm country.

This ceremony ended, the chief gives the order for starting. They immediately separate into two bands, which wheeling to the right and left, make a considerable circuit with a view to enclose the herd at a considerable interval between them. They then close upon the animals, and every man endeavours to signalize himself by the number he can kill.

It is now that the Indian exhibits all his skill in horsemanship and archery, and when the horse is going at full speed, the arrow is sent with a deadly aim and great velocity into the body of the animal behind the shoulder, where, should it not bury itself to a sufficient depth, he rides up and withdraws it from the side of the wounded and furious animal. He judges by the direction and depth of the wound whether it be mortal, and when the deadly blow is inflicted, he raises a triumphant shout to prevent others from engaging in the pursuit, and dashes off to seek new objects for destruction, until his quiver is exhausted or the game has fled too far.

Although there is an appearance of much confusion in this engagement, and the same animal receives many arrows from different archers before he is mortally wounded or despatched, yet as every man knows his own arrows, and can estimate the consequences of the wounds he has inflicted, few quarrels ever occur as to the right of property in the animal. A fleet horse well trained runs parallel with the bison at the proper distance, with the reins thrown on his neck, turns as he turns, and does not lessen his speed until the shoulder of the animal is presented, and the mortal wound has been given; then by inclining to one side, the rider directs him towards another bison. Such horses are preserved exclusively for the chase, and are very rarely subjected to the labour of carrying burdens.*

The effect of training on the Indian horses, is well shown in a circumstance related by Lewis and Clarke. A sergeant had been sent forward with a number of horses, and while on his way, came up with a herd of bisons. As soon as the loose horses discovered the herd, they immediately set off in pursuit, and surrounded the bisons with almost as much skill as if they had been directed by riders. At length the sergeant was obliged to send two men forward to drive the bisons from the route before they were able to proceed.

The skins of the bison furnish the Indians and Whites with

* Say, Long's Exp. to the Rocky Mountains, v. 2.

excellent robes, for bedding, clothing, and various purposes. These are most usually the skin of cows, as the hide of the bull is too thick and heavy to be prepared in the way practised by the squaws, which is both difficult and tedious. This consists in working the hide, moistened with the brains of the animal, between the hands, until it is made perfectly supple, or till the thick texture of the skin is reduced to a porous and cellular substance. These robes form an excellent protection from rain, when the woolly side is opposed to it, and against the cold when the woolly surface is worn next the skin. But when these robes are wet, or for a considerable time exposed to moisture, they are apt to spoil and become unpleasant, as the Indian mode of dressing has no other effect than to give a softness and a pliancy to the leather. On these robes the Indians frequently make drawings of their great battles and victories; a great variety of such painted robes are to be seen in the Philadelphia Museum. The hair of the bison has been used in the manufacture of a coarse cloth, but this fabric has never been extensively employed.

We have already adverted to the great numbers of these animals which live together. They have been seen in herds of three, four, and five thousand, blackening the plains as far as the eye could view.

Some travellers are of opinion that they have seen as many as eight or ten thousand in the same herd, but this is merely a conjecture. At night it is impossible for persons to sleep near them who are unaccustomed to their noise, which from the incessant lowing and roaring of the bulls, is said very much to resemble distant thunder. Although frequent battles take place between the bulls, as among domestic cattle, the habits of the bison are peaceful and inoffensive, seldom or never offering to attack man or other animals, unless outraged in the first instance. They sometimes, when wounded, turn on the aggressor, but it is only in the rutting season that any danger is to be apprehended from the ferocity and strength of the bison bull. At all other times, whether wounded or not, their efforts are exclusively directed towards effecting their escape from their pursuers, and at this time it does not appear that their rage is provoked particularly by an attack on themselves, but their unusual intrepidity is indiscriminately directed against all suspicious objects.

We shall conclude this account of the bison, by introducing the remarks of John E. Calhoun, Esq.,* relative to the extent

* Long's Exp. to the source of the St. Peter's river, ii. p. 28.

of country over which this animal formerly roved, and which it at present inhabits.

The buffalo was formerly found throughout the whole territory of the United States, with the exception of that part which lies east of Hudson's river and Lake Champlain, and of narrow strips of coast on the Atlantic and the Gulf of Mexico. These were swampy and had probably low thick woods.—That it did not exist on the Atlantic coast is rendered probable, from the circumstance that all the early writers whom Mr. Calhoun has consulted on the subject, and they are numerous, do not mention them as existing then, but further back. Thomas Morton, one of the first settlers of New England, says, that the Indians "have also made description of great heards of well growne beasts, that live about the parts of this lake," Erocoise, now Lake Ontario, "such as the christian world, (untile this discovery,) hath not bin made acquainted with. These beasts are of the bignesse of a cowe, their flesh being very good foode, their hides good lether, their fleeces very useful, being a kind of wolfe, as fine almost as the wolfe of the beaver, and the salvages do make garments thereof;" he adds, "It is tenne years since first the relation of these things came to the ears of the English."* We have introduced this quotation, partly with a view to show that the fineness of the buffalo wool, which has caused it within a few years to become an object of commerce, was known as far back as Morton's time; he compares it with that of the beaver, and with some truth; we were shown lower down on Red river, hats that appeared to be of very good quality; they had been made in London with the wool of the Buffalo. An acquaintance on the part of Europeans with the animal itself, can be referred to nearly a century before that: for in 1532, Guzman met with buffalo in the province of Cinaloa.† De Laet says, upon the authority of Gomara, when speaking of the buffalo in Quivira, that they are almost black, and seldom diversified with white spots.‡ In his history written subsequently to 1684, Hubbard does not enumerate this animal among those of New England. Purchas informs us, that in 1613 the adventurers discovered in Virginia, "a slow kinde of cattell as big as kine, which were good meate."§ From Lawson, we find that great plenty of buffaloes, elks, &c., existed

* New English Canaan, by Thomas Morton, Amsterdam, 1637, p. 98.

† De Laet, *Americæ utriusque Descriptio*, Lugd. Batav. anno 1633, lib. 6. cap. 6.

‡ Idem, lib. 6, cap. 17.

§ Purchas ut supra, p. 759.

near Cape Fear river and its tributaries;* and we know that some of those who first settled the Abbeville district in South Carolina, in 1756, found the buffalo there. De Soto's party, who traversed East Florida, Georgia, Alabama, Mississippi, Arkansas Territory, and Louisiana, from 1513 to 1543, saw no buffalo, they were told that the animal was north of them; however, they frequently met with buffalo hides, particularly when west of the Mississippi; and Du Pratz, who published in 1758, informs us that at that time the animal did not exist in lower Louisiana. We know however of one author, Bernard Romans, who wrote in 1774, and who speaks of the buffalo as a benefit of nature bestowed upon Florida.— There can be no doubt that the animal approached the Gulf of Mexico, near the Bay of St. Bernard; for Alvar Nunez, about the year 1535, saw them not far from the coast; and Joater, one hundred and fifty years afterward, saw them at the Bay of St. Bernard. It is probable that this Bay is the lowest point of latitude at which this animal has been found east of the Rocky Mountains. There can be no doubt of their existence west of those mountains, though Father Venegas does not include them among the animals of California, and although they were not seen west of the mountains by Lewis and Clarke, nor mentioned by Harmon and Mackenzie as existing in New Caledonia, a country of immense extent, which is included between the Pacific Ocean, the Rocky Mountains, the territory of the United States, and the Russian possessions, on the northwest coast of America. Yet their existence at present on the Columbia appears to be well ascertained, and we are told that there is a tradition among the natives, that shortly before the visit of our enterprising explorers, destructive fires had raged over the prairies and driven the buffalo east of the mountains. Mr. Dougherty, the very able and intelligent sub-agent, who accompanied the expedition to the Rocky Mountains, and who communicated so much valuable matter to Mr. Say, asserted that he had seen a few of them in the mountains, but not west of them. It is highly probable that the buffalo ranged on the western side of the Rocky Mountains, to as low a latitude as on the eastern side. De Laet says, on the authority of Henera, that they grazed as far south as the banks of the river Yaquimi.† In the same chapter this author states that Martin Perez had, in

* Lawson *ut supra*. p. 48, 115, &c.

† "Juxta Yaquimi fluminis ripas tauri vaccæque et prægrandes cervi pascuntur," *ut supra* lib. 6, cap. 6.

1591, estimated the province of Cinaloa, in which this river runs, to be three hundred leagues from the city of Mexico.— This river is supposed to be the same, which, on Mr. Tanner's map of North America, (Philadelphia, 1822,) is named Hiaqui, and situated between the 27th and 28th degrees of north latitude. Perhaps, however, it may be the Rio Gila which empties itself into latitude 32° . Although we may not be able to determine with precision the southern limit of the roamings of the buffalo west of the mountains, the fact of their existence there in great abundance, is amply settled by the testimony of De Laet, on the authority of Gomara, l. 6, c. 17, and of Purchas, p. 778. Its limits to the north are not easier to determine. In Hakluyt's collection we have an extract of a letter from Mr. Anthonie Parkhurst, in 1578, in which he uses these words: in the Island of Newfoundland there "are mightie beastes, like to camels in greatnesse, and their feete cloven. I did see them farre off, not able to discern them perfectly, but their steps showed that their feete were cloven and bigger than the feete of camels. I suppose them to be a kind of buffes, which I read to bee in the countrys adjacent, and very many in the firme land."* In the same collection, p. 689, we find, in the account of Sir Humphrey Gilbert's voyages, which commenced in 1583, that there are said to be in Newfoundland, "buttolflies, or a beast, it seemeth by the tract and foote, very large in the manner of an ox." It may, however, be questioned whether these were not musk oxen, instead of the common buffalo or bison of our prairies. We have no authority of any weight which warrants us in admitting that the buffalo existed north of Lakes Ontario, Erie, &c. and east of Lake Superior. From what we know of the country between Nelson's River, Hudson's Bay, and the lower Lakes, including New South Wales and Upper Canada, we are inclined to believe that the buffalo never abounded there, if indeed any were ever found north of the lakes. But west of Lake Winnepeck, we know that they are found as far north as the 62nd degree of north latitude. Capt. Franklin's party killed one on Salt river, about the 60th degree. Probably they are found all over the prairies which are bounded on the north by a line commencing at the point at which the 62nd degree meets the base of the Rocky Mountains, and running in a south easterly direction, to the southern extremity of Lake Winnepeck, which is but very little north of the 50th degree; on the Sardatchawan,

* The principal navigations, voyages, and discoveries of the English nation, &c. by Richard Hakluyt, London, 1589. p. 676.





Eng. d by G. B. Ellis.

Musk Ox.

Drawn by C. A. Lesueur

buffalo are very abundant. It may be proper to mention here, that the small white buffalo, of which Mackenzie makes frequent mention, on the authority of the Indians, who told him that they lived in the mountains, is probably not the bison; for Lewis and Clarke inform us, that the Indians designated by that name the mountain sheep.* It is probable that west of the Rocky Mountains the buffalo does not extend far north of the Columbia. At present it is scarcely seen east of the Mississippi, and south of the St. Lawrence. Governor Cass's party found in 1819, buffalo on the east side of the Mississippi, above the falls of St. Anthony: every year this animal's roving is restricted. In 1822, the limit of its wanderings down the St. Peter, was great Swan Lake (near Camp Crescent.)

SPECIES II.—*The Musk Ox.*

Bos Moschatus; GMEL.

Musk Ox: PENN. Quad. i. 31. Ibid. Arct. Zool. 3 vol. i. 8.

Musk Ox: HEARNE, Journey, &c. 8vo. 135.

Bœuf Musqué: BUFF. Hist. Naturelle, Suppl. vi.

Ovibos† Musqué: BLAINV. Nouv. Bullet. de la Soc. Philom.

Musk Ox: Parry's Voyage, i. 202.

[Called *Mathek-Mongsoo*, or *Ugly Moose*, by the Crees,
Uming Mak, by the *Esquimaux*.]

To civilized man, the extreme northern regions may appear cheerless and uninviting, because they are subjected to the almost unrelenting influence of wintry skies. Yet we have already seen that they are the favourite resorts of multitudes of animals, varying in size, characters, and habits, from the Lemming to the Moose. A species remains to be described, which, of these forbidding regions, prefers the most barren

* Vol. ii. p. 325.

† Mr. De Blainville proposed to establish a new genus, to be called *Ovibos* or *Sheep-ox*, of which the Musk-ox is the first species. His generic distinctions are drawn from the resemblance between the outline of the front of the musk-ox and that of the sheep, and from the absence of the muzzle or smooth naked surface, between the nostrils, and upon the upper lip. This division, though as well founded as that which separates *Capra* from *Ovis*, we conceive to be altogether unnecessary, as the characters are not more than sufficient to establish a specific difference. In regard to the muzzle, nothing is said in the text of Parry's work, though it is very distinctly represented in the plate, which is said to be very accurate, and which we have copied; as the common descriptions of the musk-ox have mostly been taken from dried skins, it is possible, that the absence of the muzzle has been stated too hastily.

and desolate parts, and is found in the greatest abundance in the rugged and scarcely accessible districts lying nearest the North Pole. This species so far from being condemned to a life of extreme privation and suffering, appears to derive as much enjoyment from existence, as those which feed in more luxuriant pastures, or bask in the genial rays of a summer sun.

In destining the musk ox to inhabit the domains of frost and storm, nature has paid especial attention to its security against the effects of both; first, by covering its body with a coat of long, dense hair, and then, by the shortness of its limbs, avoiding the exposure that would result from a greater elevation of the trunk. The projection of the orbits of the eyes, which is very remarkable in this species, is thought by *PARRY* to be intended to carry the eye clear of the large quantity of hair required to preserve the warmth of the head.

Although some few items relative to this animal are to be gathered from the works of the recent explorers of the Northern Regions, it is to *HEARNE* that we are almost exclusively indebted for the Natural History of the musk ox, as we have already been for that of most of the animals inhabiting the same parts of this continent. This excellent and accurate observer travelled, in the years '69, '70, '71, and '72, and it is only to be regretted that he did not write down all he knew in relation to the northern animals. He appears to have frequently thought that what was so familiarly known to him, would not be of much interest to others, and has thus withheld knowledge that few individuals can have a similar opportunity of gaining. Notwithstanding this, he has anticipated all the recent explorers in every essential observation.

HEARNE states that he has seen many herds of musk oxen in the high northern latitudes, during a single day's journey, and some of these herds contain from eighty to a hundred individuals, of which number a very small proportion were bulls, and it was quite uncommon to see more than two or three full grown males, even with the largest herds. The Indians had a notion that the males destroy each other in combating for the females, and this idea is somewhat supported by the warlike disposition manifested by these animals during their sexual seasons. The bulls are then so jealous of every thing that approaches their favourites, that they will not only attack men or quadrupeds, but will run bellowing after ravens or other large birds that venture too near the cows.

Musk oxen are found in the greatest numbers within the arctic circle; considerable herds are occasionally seen near the coast of Hudson's Bay, throughout the distance from

Knapp's Bay to Wager Water. They have in a few instances been seen as low down as lat. 60° N. Capt. Parry's people killed some individuals on Melville Island, which were remarkably well fed and fat. They are not commonly found at a great distance from the woods, and when they feed on open grounds they prefer the most rocky and precipitous situations. Yet, notwithstanding their bulk and apparent unwieldiness, they climb among the rocks with all the ease and agility of the goat, to which they are quite equal in sureness of foot. Their favourite food is grass, but when this is not to be had, they readily feed upon moss, the twigs of willow, or tender shoots of pine.*

The appearance of the musk ox is singular and imposing, owing to the shortness of the limbs, its broad flattened crooked horns, and the long dense hair which envelopes the whole of its trunk, and hangs down nearly to the ground. When full grown, the musk ox is ten hands and a half high, according to Parry, and as large as the generality, or at least the middling size of English black cattle; but their legs, though large, are not so long; nor is their tail longer than that of a bear, and like the tail of that animal it always bends downwards and inwards, so that it is entirely hid by the long hair of the rump and hind quarters. The hunch on their shoulders is not large, being little more in proportion than that of a deer. Their hair is in some parts very long, particularly on the belly, sides and hind quarters; but the longest hair about them, particularly the bulls, is under the throat, extending from the chin to the lower part of the chest, between the forelegs; it there hangs down like a horse's mane inverted, and is full as long.†

* It is singular and well worthy of observation, that the dung of the musk ox, though so large an animal, is not larger than, and, at the same time, is so nearly of the shape and colour of that of the Alpine Hare, that the difference is not easily distinguished, except by the Indians, though the quantity generally indicates the animal to which it belonged. In the country adjacent to the Coppermine river, long ridges of this dung, together with that of deer and other animals, were seen by Hearne. Similar appearances were observed by Parry on several of the North Georgian Islands.

† "Mr. Dragge says in his voyage, vol. 2. p. 260, that the musk ox is lower than a deer, but larger as to belly and quarters; which is very far from the truth. They are of the size I have here described them, and the Indians always estimate the flesh of a full grown cow to be equal to three deer. I am sorry also to be obliged to contradict my friend Mr. Graham, who says that the flesh of this animal is carried on sledges to Prince of Wales's Fort, to the amount of three or four thousand pounds annually. To the amount of near one thousand

The winter coat of the musk ox is formed of two sorts of hair, which is generally of a brownish red, and in some places of a blackish brown colour; the external being long, coarse, and straight, and the internal, fine, soft and woolly. The outer hair is so long that it hides the greater part of the limbs, causing them to look disproportionately short. As the summer comes on, the short woolly hair is gradually shed, but the summers are so short in these high latitudes, that the woolly coat commences growing almost immediately after the old coat is shed, so that the entire winter coat is completed by the return of the cold weather.

From the shortness of the limbs and the weight of the body, it might be inferred that the musk ox could not run with any speed; but it is stated by Parry, that although they run in a hobbling sort of canter that makes them appear as if every now and then about to fall, yet the slowest of these musk oxen can far outstrip a man. When disturbed and hunted, they frequently tore up the ground with their horns, and turned round to look at their pursuers, but never attempted to make an attack.

The month of August is the season in which the musk bulls are most disposed to combat, as they then fight furiously with each other for the females, and are jealous of the approach of every thing, as already stated. The cows calve about the end of May or the beginning of June; the calves are frequently whitish, but more commonly marked by a white patch or saddle upon the back.

The musk oxen killed on Melville Island during PARRY'S visit, were very fat, and their flesh, especially the heart, although highly scented with musk, was considered very good food. When cut up it had all the appearance of beef for the market. HEARNE says that the flesh of the musk ox does not at all resemble that of the bison, (*Bos Americanus*) but is more like that of the moose, and the fat is of a clear white tinged with light azure. The young cows and calves furnish a very palatable beef, but that of the old bulls is so intolerably musky, as to be excessively disagreeable. A knife used in cutting up

pounds may have been purchased from the natives in some particular years, but it more frequently happens that not an ounce is brought one year out of five, and in fact, all that has ever been carried to Prince of Wales's Fort, has most assuredly been killed out of a herd that has been accidentally found within a moderate distance of the settlement, perhaps within a hundred miles; which is only thought a step by an Indian." Hearne, 136. (The fort he mentions was destroyed by the French in 1782.)

such meat becomes so strongly scented with this substance, as to require much washing and scouring before it is removed.* Musk ox flesh when dried, is considered by hunters and Indians to be very good. "In most parts of Hudson's Bay it is known by the name of Kew-hagon, but amongst the Northern Indians it is called Achees." The weight of the musk ox, according to Parry, is about 700 lbs. that of the head and hide is 130 lbs.

The horns of the musk ox are employed for various purposes by the Indians and Esquimaux, especially for making cups and spoons. From the long hair growing on the neck and chest, the Esquimaux make their musquitoe wigs, to defend their faces from those troublesome insects. The hide of the musk ox makes good soles for shoes, and is much used by the natives for this purpose.

During the months of August and September the musk oxen extend their migrations to the North Georgian and other Islands bordering the northern shores of the continent. By the first of October they have all left the islands and moved towards the south. By FRANKLIN's Expedition, they were not seen lower than 66 deg. N. though, as we have before stated from HEARNE, they are occasionally seen as low as 60 deg.

* *Moschus iste glandulis juxta præputium positis efformari videtur; ibi materia fusca, concreta, fortissime moschi odorans inventa est.*

CHAPTER XII.

ORDER VIII. CETE ; *Cetaceous Animals.*

CETACEOUS animals in general appearance and in mode of living, bear a considerable resemblance to fish, with which they are popularly confounded ; but by all the details of their conformation, their manner of respiration and the nourishment of their offspring, they are entitled to rank in the first class of animals, although at the inferior extremity of the scale.

In these creatures the head is joined to the trunk by so short and thick a neck, as to appear continuous with the body, and this large neck is in the greater number capable of very little, if any motion, owing to the consolidation of several of the slender cervical vertebræ. The trunk of the body gradually decreases until it terminates in a thick tail, which ends in a horizontal cartilaginous fin, and when used by the animal in effecting its forward motion, is moved up and down, never laterally.

The anterior extremities or arms, although in all respects analogous to those of the higher orders of animals, have the bones shortened, flattened and enveloped in a tendinous membrane, so as to be effectually converted into fins. The posterior extremities or limbs are entirely wanting.

The brain is large and well developed. The bone containing the organ of hearing, or internal ear, is separated from the rest of the head, being attached thereto by ligament alone. The orifice of the external ear is very small and destitute of external appendage. The teats, two in number, are either pectoral or abdominal.

CHAPTER XIII.

FAMILY I. SIRENIA ; *Herbivorous Cetacea.*

THIS family is distinguished especially by the vegetable diet of the animals belonging to it, which is indicated by their flat grinding teeth. The head is not very large, and has always a short and obtuse snout, at the extremity of which the external openings of the nostrils are situated, notwithstanding they pass through the bones of the head from the superior part. The mouth is garnished with long bristles or whiskers, and the teats are situated upon the chest.

The anterior extremities, though compressed, are still sufficiently free to allow them to be used for the purpose of carrying any thing by holding it against the body, the young, for instance, being thus held by the mother. The tail is not very large, but is powerful. These animals swim with great facility, and as they are able to raise the anterior parts from the water, so as to form a considerable angle with the trunk, it is considered as highly probable that the various fables of sirens, tritons and mermaids may have originated from an imperfect observation of their actions.

It must be admitted that the members of this family present little in their general appearance to excite attention, unless it be their huge and almost shapeless bodies ; but their internal structure, actions and habitudes, afford very ample scope for interesting observations and philosophical inquiry ; as it would not be easy, from any previous knowledge, to believe that merely herbivorous animals would be found inhabiting the ocean, conformed in all respects, so as closely to approach in external appearance to fish, and yet in all the characters of teeth, mode of feeding and digestive organs, to bear a very marked resemblance to herbivorous land quadrupeds.

CHAPTER XIV

GENUS I.—LAMANTIN; *Manatus*, C.

GENERIC CHARACTERS.

THE head is small and conical, with a broad snout and rather small mouth; the eyes are placed high up between the extremity of the snout and the openings leading to the ears, which are very small and hardly visible. The spine is composed of seven very short cervical, seventeen dorsal, two lumbar, and twenty-two caudal vertebræ. The ribs are seventeen in number. In addition to the shoulder blade, arm and forearm, the lamantins have all the wrist or carpal bones, with the single exception of the pisiform, the phalanges of the thumb are wanting, and the corresponding metacarpal bone terminates in a point. All the other digits have three phalanges. The stomach has several cavities, the cæcum two branches, and the colon is very large; in all which circumstances they strongly resemble the pachydermatous land animals, along with which they have been considered by some naturalists.* The surface of the body is entirely destitute of hair.

Dental System.

34 Teeth:	{	18 Upper	{	2 Incisive.
			{	16 Molar.
	{	16 Lower	{	16 Molar.

IN THE UPPER JAW, in young individuals, two small pointed incisive teeth are found, somewhat similar to those of the morse. There are no canines. The eight molars resemble each other; they have a general square form, and all present two transverse eminences, formed of three tubercles, separated from each other by a deep groove: they all have three divergent roots,

* Blainville at first arranged them with the unguligrada, and subsequently with the gravigrada, as the Elephants, &c. See Ranzani, *Elem. di Zoologia*, ii. parte iii. p. 670.

one internal, the other two external. They increase gradually, but almost imperceptibly, in size from the first to the last.

IN THE LOWER JAW neither incisive nor canine teeth are ever found, and the molars resemble those of the upper jaw, except in having a spur posteriorly, or a third eminence much smaller than the others. These teeth have two roots, one in front, the other behind, at first simple, but enlarged and are bifurcated at their extremity.

In their reciprocal position, the eminences on one side correspond to the grooves and intervals of the teeth on the opposite side, and to judge by the preservation of the crests of the eminences, it appears that these teeth are used more for triturating than for crushing or bruising the food.

SPECIES I.—*American Lamantin.*

Manatus Americanus.

Trichecus Manatus, L. *Systema Naturæ*.

Manate ou Vache Marine: Dampier. voyage i. 46. SLOANE, Jamaica, ii. 329. La Condamine, voyage, 154.

Manati Phoca genus, OLUS. exot. 132.

Lamantin ou Manaty: Du TERTRE, Hist. gen. des Antilles.

Grand Lamantin des Antilles, BUFF. Hist. Naturelle xiii. 377, C. Ann. du Museum xviii. 282, pl. 19. IBID. Ossem. Foss. iv; DESM. Nouv. Dict. d'Hist. Nat. xviii. 213, pl. G. 9.

Manatee or Sea Cow: BARTRAM, Travels in Florida, 231.

If the reader infer from the number of authorities prefixed to this article, that the history of the species is amply or satisfactorily known, he will fall into an error, which a very little experience in books of travels, or systematic works of natural history, would serve to correct. Indeed, as a general rule, the number of references affixed, is in an inverse proportion to the amount of knowledge concerning the animal treated of, and it not unfrequently happens that the mere mention of the name of a species, is all that occurs in a book quoted with all the formality of title and page. Bartram, for instance, who travelled in the country where the lamantin is most commonly found, gives the whole amount of his observation in nine unsatisfying lines. Other observers, who have enjoyed equally good opportunities, have contented themselves with a mention of the animal, taking it for granted that no other information was desirable.

Of this species we know little or nothing, but what is given by CUVIER in the scientific works above quoted, and from the observations made by Du Tertre in his history of the Antilles.

The general figure of the lamantin is rather elliptical and

elongated. Its head is shaped like a simple truncated cone, and terminates in a thick and fleshy snout, semi-circular at its extremity, and pierced at its upper part by two small semilunar nostrils, directed forwards. The edge of the upper lip is tumid, furrowed in the middle, and provided with thick and stiff whiskers. The lower lip is narrower and shorter than the upper, and the opening of the mouth is small. The eyes are situated towards the upper part of the head, at the same distance from the snout as the angle of the lips. The ears are very small, scarcely perceptible, and placed at the same distance from the eyes that the latter are from the snout.

The neck is not distinguishable by any diminution or difference in size from the head and trunk, and the latter does not diminish except from the umbilicus, whence it rapidly decreases, until it spreads out and becomes flattened, forming an oblong tail with a broad, thin, and seemingly truncated extremity. The tail forms about a fourth of the length of the animal.

The arm bones which sustain the fins are more separated from the body than those of the *Delphinus*, and have digits more distinguishable through the integuments. The edges of this fin have four flat and rounded nails, which do not extend beyond the membrane, the nail of the thumb being deficient. The skin is of a gray colour, is slightly shagreened, and has upon it a few scattered hairs, which are more numerous than elsewhere about the angles of the lips and the palmar surface of the fins.

The full grown lamantin is from fifteen to twenty feet in length, by eight in circumference, and weighs several thousand pounds.

Du TERTRE states that the sight of the lamantin is very feeble, but this defect is compensated by the extreme acuteness of its hearing. In these respects it closely resembles the seal. After having satisfied its hunger by feeding on the sea-grass or fucus, which constitute its principal nourishment, it delights to sleep upon the marshy grounds in shallow water, where it lies with the snout elevated above the water.

When the lamantin is discovered in this situation, the following mode of securing it is resorted to; three, or at most four persons get into a canoe, which is managed by the man in the bow, who moves his paddle from right to left, without lifting it from the water, so as to impel the canoe swiftly and without noise. The harpooner sits on a board placed across the canoe in the forward part, and the third person is placed in the middle of the boat to manage the line attached to the end of the harpoon.

The canoe is then swiftly paddled towards the sleeping animal, the men observing the most profound silence. When within three or four paces of the lamantin, the harpoon is suddenly struck into its body. The most violent efforts are then made by the wounded animal, which leaps up and springs forward with great force, making the sea foam, by the celerity of its movements. Tired, at length, with fruitless efforts to escape, and weakened by loss of blood, the lamantin stops short, is again wounded by other harpoons, and after a few more unavailing struggles, yields its liberty and life together.

The female lamantin brings forth her two young, which follow her closely, and are very certainly captured, if the mother be killed. The flesh of the lamantin is considered an excellent article of diet, and has, at former periods, furnished a large part of the subsistence of the inhabitants of St. Christophers, Guadaloupe, and Martinique. This flesh has the taste of veal, but is more solid, and covered in various parts with two or three inches of fat, which is used for the same purposes that lard is commonly employed for. It is so good that many persons melt the fat, and eat the oil upon bread instead of butter. When salted, the flesh of the lamantin looses its flavour and becomes very dry and hard.

The name of manati, (subsequently changed to lamantin,) is said to have been originally given to this animal by the Spaniards, in consequence of its short anterior extremities, which were regarded as hands.

CHAPTER XV.

GENUS?—STELLER ; *Stellerus*, C.

Rytina, ILL. *Trichecus*, GMEL. *Manatus*, STELL.

GENERIC CHARACTERS.

Head is blunt, joined to the body by a short indistinct
has no external ears; the eyes are defended by a
cartilaginous membrane instead of lids; the nostrils
are at the extremity of the snout; both upper and
lower are vertically divided. The anterior extremities
are similar to those of the sea-turtle. The caudal
is broad, crescent shaped, and terminates on each side
in a point. The skin is hairless, but is defended by an
only thick epidermis, composed of fibres perpendicular
to the true skin. The stomach is simple; the intestines

SPECIES I.—*Boreal Steller*.**Stellerus Borealis*; DESM.*Manatus*: STELL. Act. Petrop. Com. Nov. ii. 294.*Trichecus Manatus*: V. Borealis, GMEL.*Whale-tailed Manati*: PENN. Arct. Zool.*Whale-tailed Trichecus*: SHAW. Gen. Zool.*Rytina Stelleri*: DESM. N. Dict. D'Hist. Nat. xxix. 575.*Stellerus Borealis*: IBID. Mammalogie, sp. 752. p. 510.

The only detailed account of the manners and habits of this singular animal, is that originally given by *Steller* in the transactions of the Imperial Academy of Sciences of St. Petersburg, in 1749. From his valuable paper, which contains numerous highly interesting observations on other animals, we have translated the following faithfully observed facts.†

An unfortunate accident gave me an opportunity of observing the manners and habits of these animals, daily, before the door of our hut. They delight in the shallow sandy places, near the shores of the sea, and are very fond of frequenting the mouths of brooks and little rivers, being allured by the sweetness of the running water; they always go in troops, the half grown and young occupy the front in feeding, but are solicitously enclosed on the flanks and rear, so as to be always kept in the midst of the troop. When the tide is high, they come so close to the shore, that I have not only frequently touched them with a staff or lance, but have placed my hand upon their backs. If struck with some force, they did nothing more than move a little farther off, and in a short time forgetting the injury, they would return. Entire families commonly live together, a male with a single female, and a small quite young cub. They appeared to me to be monogamous, bringing forth at any time of the year, but most generally in the autumn, as I should judge from the young about that time; hence, as I have observed them most especially to couple in the spring, I have concluded that they bear their young for more than a year, and do not bring forth but one cub at a birth. I never observed more than one cub in company with the mother.

* Cuvier named the genus formed for this species, in honour of *Steller*; we use his name for the common appellation, because we wish to avoid confounding this animal with the *Manati* by using Pennant's term.

† This paper is entitled "De Bestiis marinis auctore Georgio Wilhelmo Stellero." Vide Nov. Comm. Acad. Scien. Imper. Petropolitane, tom. 2, p. 299, 294, et seq.

These most voracious animals are almost incessantly feeding, and on account of this greediness, have their heads nearly always under water, being very little solicitous concerning life and safety. A boat or a man may go into the midst of a troop, and one may be selected and secured by a hook without difficulty. All this must be done while they are feeding, as at the end of every four or five minutes they raise their nostrils above water, and blow out the air with a small quantity of water, making a noise like the snorting of a horse. While grazing, they move slowly forwards, one foot after the other, and thus in part placidly swim, and partly walk, like oxen or sheep browsing. The half of the body, that is, the back and sides, always project above the water while they are feeding, and the gulls alight thereon for the purpose of picking up the parasite animals with which their hides are much infested, just as the ravens alight on the backs of hogs to catch their lice.

They do not devour all the sea-weeds indifferently, but chiefly two or three species of *Fucus* or *Kelp*, of which, when these animals have remained a day or so in one vicinity, large heaps of the roots and stalks are thrown ashore by the waves. Having gorged themselves fully, some of them sleep upon their backs, at some distance from the shore, lest they be left aground by the tide. They are frequently killed by the floating ice in winter, which especially occurs if the waves are blown forcibly upon the rocks, among which these beasts are entangled and killed. In the winter they become so thin that in addition to the back bones, all the ribs may be counted through the skin.*

They are caught with a large iron hook, whose extremity resembles the fluke of an anchor; the other end has a ring, to which a strong rope is secured. A strong man takes this hook, and in company with four or five others, goes into a boat, which is slowly rowed towards the herd. The bearer of the hook stands in the prow of the boat, and as soon as he comes near enough, strikes it into one of the animals. Thirty or more persons on shore then get hold of the rope and drag the struggling victim towards the land. Those in the

* "Vernali tempore more humano coeunt, ac præcipue circa vesperam tranquillo mari; antequam vero congregiuntur præludia multa venerea præmittunt; femella placide natat hinc et inde in mari, mas vero semper sequitur; hunc femella tam diu multis gyrps et meandris eludit, donec moræ ulterioris ipsa impatiens, velut delassata ac coacta, se in dorsum resupinet, quo facto mas furiose superveniens libidinis tributum solvit, ac ambo in mutuos amplexus ruunt." *Steller. ut supra.*

boat make themselves fast to the beast with another rope; and so fatigue it by repeated blows, until it becomes quiet, and then is despatched by spears, knives, and other weapons, and drawn on shore. Some cut huge pieces out of the living animal, which only provoke it to vibrate its tail, and struggle with its fore limbs so violently as to cause large pieces of the cuticle to fly off; it breathed strongly, and as if sighing. When wounded in the back, the blood spirts as high as if from a fountain; but this did not occur as long as the head was retained under water, but as soon as it was raised for the purpose of breathing, the blood gushed forth, because the lungs, lying next to the back, being wounded, whenever the air was inhaled, it forced out the blood more freely.

When one of these animals is hooked, he begins to move more impetuously, whereupon the herd and those which are near are set in motion, and endeavour to assist the captive. Some of them strive to upset the boat, others endeavour to break the rope, or by blows with their tails, try to disengage the hook, which they sometimes successfully accomplish. It is a very curious trait in their character, that their conjugal love is exceedingly great: when the male is hooked, the female, after having in vain struggled to set him free, and been herself struck frequently, would nevertheless follow her companion to the shore, and would sometimes unexpectedly approach the dead body, by darting forwards like an arrow. One morning, when we came down very early to cut up the flesh and carry it home, we found the male near the body of his mate, and he remained near even until the third day afterward, when I went down to the shore alone, for the purpose of clearing some of the intestines.

This animal has no voice, nor utters any sound, merely breathing forcibly, and when wounded, as if by sighs. Its organs of sight and hearing are of slight power, as they are almost always submerged and appear to be little employed.

We have stated in the specific description, as well as the generic characters, the peculiar structure of the skin of the steller. It will perhaps be still more satisfactory to the reader to have the more detailed description of it from the original observer, whose statement we subjoin.

The hide of this animal is black, rough, wrinkled, knotty, hard, tough, and destitute of hair, the epidermis being an inch thick, and scarcely to be penetrated by an axe or an iron hook. When cut transversely, this cuticle resembles ebony, both in polish and colour. The skin is smooth on the back; from the neck to the tail fin it has nothing but superficial circular wrinkles: the sides, however, are exceedingly knotty, having many

THE STELLER.

acetabula, especially about the head, bearing an resemblance to mushrooms.

The cuticle above described is like a crust surrounding the animal, and appears to be composed of mere tubes. These are placed perpendicularly to the true skin, and may be separated from each other in their length. The inferior part of each tube which is implanted in the skin, is rounded, conical, and bulbous; hence, a portion of cuticle torn off appears as if it were like Spanish hide, while the subjacent skin presents the appearance of numerous little pits, which the cuticular tubes occupy. As these tubuli lie very closely together, the skin is moist and tumid, when the skin is cut horizontally it does not appear, but presents a smooth surface like the pared surface of an animal; if pieces be dried in the sun, they crack and separate, and may be broken like bark, at which time the tubular structure is perfectly obvious. Through these tubes mucous matter flows, especially upon the sides and head, and in smaller quantities upon the back. When the seal lies upon the shore for some hours, the back dries, but the head and sides remain moist. The use of the cuticle appears to be, 1st. to preserve them from injury, and 2dly. that the animal may not be too





W. J. Thayer Sc.

Dolphin.

CHAPTER XVI.

FAMILY II.—CETÆ ; *Piscivorous Cetaceous Animals.*

THIS family is distinguished from the preceding by the construction which has procured for all its members the name of *blowers*, in reference to the manner in which they expel the water taken in along with their food from the nasal openings. The membrane lining the nostrils being thus continually exposed to torrents of salt water, has very little if any sensibility as an organ of smelling.

They have a pyramidal larynx, or windpipe, which is extended to the posterior opening of the nostrils, through which the air is admitted to the lungs without requiring the head and mouth to be raised above the water. Their glottis is altogether plain, and their voice is reduced to a simple bellowing. The body is destitute of hair, but is covered by a thick, smooth skin, beneath which is a great thickness of strong cellular substance containing a large quantity of oil.

The teats are situated near the anus ; the fins are of no use except in swimming. Two small bones situated in the flesh near the extremity of the digestive canal, are the only vestiges of inferior extremities. Some have a dorsal fin, which is tendinous, and not connected with the skeleton.

Some of these animals have conical teeth, all of the same sort, arranged along the edges of the jaws ; others have only horny layers, projecting from the roof of the mouth, well known by the name of *baleen*, though generally and inaccurately called *whalebone*.

The eyes, which are flat anteriorly, have a very thick and solid sclerotica or external coat. The tongue is covered by a soft and thick integument. The stomach has from five to seven distinct pouches, and instead of one spleen, there are several, which are small and lobular.

TRIBE I.—DELPHINUS ; L. *Dolphin Proper* ; C.

Having teeth in both jaws, always simple and almost always conical. They have the mouth formed in advance of the head, by a sort of beak, smaller than the rest of the head. They are destitute of cœcum

CHAPTER XVII.

SECTION I.—*Size of the head bearing the ordinary proportion to that of the body.*

GENUS ?—DOLPHIN ; *Delphinus* ; L.

GENERIC CHARACTERS.

THE form of the head is very various ; there is but one, semilunar, external orifice to the nostrils, which is situated upon the crown of the head ; the trunk of the body is elongated ; the tail fin is large, bifurcated and horizontal.

Dental System.

The teeth of the piscivorous cetæ scarcely differ from each other, except in number, all appearing to have the same form. They are conical and slightly hooked ; only the larger species have larger teeth than the smaller, and when their series are numerous, the anterior and posterior are smaller than those in the middle. None of them have the alveolar processes divided, nor multiplex roots ; the dental capsule remains for a long time free at the base ; but these teeth are not always growing, as the capsule is eventually obliterated. Then another event occurs ; ossification of the jaws takes place within the aveoles, and as the teeth are not opposed to each other, and no force retains them in their places, they are soon thrust out and disappear. This explains the very variable number of teeth we find in dolphins of the same species, and still more so in those of different species. Thus, not having observed between the teeth of dolphins any essential difference of form, and their differences of number not being determinate, we have nothing but the form of their heads from which to establish the generic differences.

SPECIES I.—*The True Dolphin*.*

Delphinus Delphis; L.

Le Dauphin: BONNATERRE; Cetol. 20, pl. x, fig. 2.*Dauphin Vulgaire*: DESM. Mammal. sp. 758, p. 514.[Called *Grampus*, *Porpoess*, *Herringshog*, *Dolphin*.]

Hitherto the subjects of our study have been inhabitants of grassy plains, or shady forests; the margins of gentle streams, or the outlets of mighty rivers: we now turn our attention to creatures whose most congenial dwelling is in the bosom of the ocean.

So admirably are the beings of which we are now to treat adapted to an aquatic life, that they present a similarity of appearance to, and are most commonly confounded with *fish*, though this resemblance extends no farther than to the general figure of their bodies, and the modification of structure which fits their extremities for swimming. Language can scarcely convey an idea of the velocity with which they dart through the water, seeming rather to fly than to swim; resembling an arrow impelled by a powerful bow, barely long enough in sight to allow a conviction of its having passed. Of their wonderful celerity of movement, and remarkably playful disposition, we have recently enjoyed many excellent opportunities of observation. Once in particular, on a beautifully clear day, when the sea was as strongly illuminated by the sun as to render objects visible at almost any depth, and our vessel was sailing swiftly before a strong breeze, several of these animals appeared to vie with each other in showing how poor was her speed, compared with their own. As the little troop were merrily gamboling at a short distance from the vessel's side, one of the number would dart immediately in advance of her bow, and swimming with his utmost velocity, would disappear in a straight line before her, and (as the depth at which he swam was not more than three feet,) would in a minute or two be seen returning to the crew of his comrades, as if in triumph. This was repeated many times, and most probably by different individuals. These dolphins accompanied us for a considerable distance, and all their actions ap-

* We call this the *true Dolphin* to distinguish it from the *fish* called dolphin by sailors (the *coryphæna purpuris*), and because this species is the dolphin so celebrated in various ancient poems and fables, to which we shall hereafter refer.

peared indicative of the most playful and frolicsome disposition.*

They frequently, however, are seen sailing along with a slow and measured motion, just appearing at the surface, by elevating the crown of the head and then diving short, so as to make their bodies describe the arch of a small circle, exposing themselves to view only from the crown of the head, to a short distance behind the dorsal fin. Occasionally a troop of them may be seen scudding along, rising in this manner in quick succession, as if anxious each to get in advance of the other: while again, a single individual may be observed successively rising and falling in the same way, as if engaged in the act of catching a prey.

In this way, shoals of dolphins may be seen almost every day, and at any hour, feeding or sporting in the bay and rivers near the city of New-York, where we have sometimes enjoyed an opportunity of observing from the wharf, a large shoal of them moving down the Hudson river with the tide. Some plunging along as if in haste, others apparently at play, and others very slowly rising to the surface for breath, and as gradually disappearing, allowing their dorsal fin to remain for a considerable time above the surface.

From the month of May until towards the end of autumn, the true dolphins frequent the bays and salt-water rivers of our country in great numbers.

They are most numerous, and are best observed, during the run of the herring and shad, upon which they doubtless feast abundantly; they appear gradually to diminish in number as these fish retire from the rivers and coast, though a small party may be occasionally seen very late in the season.

* "On the 20th of October, 1763, a hundred of these animals approached within pistol shot of our vessel, and appeared to have come expressly for our diversion. They made singular bounds into the air: several of them in their caperings leaped three or four feet above the water, and turned over and over several times, like professed tumblers. They go almost always in troops, and swim as if arranged in battle array: they appear to move in search of the wind. We have always remarked that they swim towards the point whence the wind arises." *Dom Pernethy*, Hist. d'un voyage aux îles Malouines, i. p. 97, &c.

"I have seen one playing around the vessel while she was going at the rate of two leagues an hour; the sailors said that it foretold a squall; in fact one came on at midnight." *St. Pierre, voyage a l'île de France*, p. 52.

In the instance above mentioned, witnessed by the author, the vessel was moving at the rate of eight miles an hour.

During the month of June, the actions of this animal appeared very different from what we have noticed at any other time. They swam in pairs, remained for a longer time at the surface, and seemed to be borne along by the tide rather than urged forwards by their own volition. They moved in half circles, lying rather upon their sides, and occasionally lashing the water into foam with their tails—then both disappearing, one in a few seconds would rise at a little distance as if pursued—make a short leap above the surface of the water, and on falling, again commence the same kind of semi-circular movement above described, accompanied by the other. We never observed them to show the beautiful inferior surface of their bodies at any other period, or to raise the tail fin above the water. But at this season, the whole inferior surface of the body on one side, was frequently visible, and the tail occasionally whirled in air, and brought down with great force.

We would have inferred that these movements belonged to their ordinary gambols, was it not for the fact that they all appeared to be paired off, and almost all the pairs seen at this time were similarly occupied. With the exception of a lapse of about three weeks in the month abovementioned, we have never observed them to act in the same manner. During the period referred to, we spent a part of every day in observing them, and have repeatedly been within eight or ten feet of the spot where they were sporting. Occasionally we have watched them for hours, until the force of the tide swept them far beyond our view.

The appearance of a shoal of these animals, at sea, moving in the same direction, is considered by experienced mariners as an indication of an approaching storm, which very certainly follows their appearance. Falconer in his beautiful poem of the Shipwreck, thus describes such a circumstance :

“ Now to the north from burning Afric’s shore,
A troop of porpoises their course explore ;
In curling wreaths they gambol on the tide,
Now bound aloft, now down the billow glide ;
Their tracks awhile the hoary waves retain
That burn in sparkling trails along the main—
These fleetest coursers of the finny race,
When threatening clouds th’ ethereal vault deface,
Their route to leeward still sagacious form,
To shun the fury of the approaching storm.”

Canto II. § II.

Relative to the breeding season of the dolphin, we have no information sufficiently exact to be relied on. We have seen them in Long-Island Sound, during the month of August, and

the first part of September, accompanied by suckers, varying in size, and from eighteen inches to two feet or more in length. In swimming, or rather in plunging, as heretofore described, the sucker apparently rested on the lateral or humeral fin of the parent, as it always was seen as if adhering to the same place by the side of the parent, in all the movements made in ascending or descending.

A full grown dolphin measures about six feet six inches in length, from the tip of the mouth to the end of the tail, and from the end of the beak to the angles of the mouth, the distance is ten and a half inches; and measuring from the same point to the breathing-hole, thirteen inches. The eyes are placed almost precisely on the same line with the angle of the mouth, and are ten and a half inches distant from each other. The lateral or humeral fins are nine and a half inches long, and four broad. The dorsal fin, measured along its anterior edge, is ten inches high; measured along its base, in the direction of the back, it is eight inches. The tail, measured at the extremity of its two lobes, is fourteen inches broad.

The body of the true dolphin, is nearly oval, having the dorsal fin to curve backwards at its summit: the beak being flattened and pointed, and containing in both jaws a range of rounded, rather pointed teeth, which project from the sockets about three-twelfths of an inch. These teeth are all arranged so as to interlock; and appear to vary according to the sex and age of the animal.* The head of this animal does not project over the beak, but is gradually enlarged backwards until in a line with the back. The line from the under surface of the lower jaw is continued with very little change of direction till opposite the dorsal fin, where the body is thickest. From a hand's breadth or more, behind the dorsal fin, the body rapidly diminishes to the tail, and on the lower surface, the same rapid diminution takes place from beyond the anus. The tail is composed of two strong lobes, terminating in points, which give a beautiful crescent shape to the extremity of this powerful instrument for swimming.

In examining the anatomical details of this animal, one cannot fail to be struck with the singular appearance of the bones forming the lateral fins. We find a shoulder blade, an arm bone, bones of the forearm, wrist and fingers, all so modified as when covered by the skin, to resemble nothing so much as a fin, yet so obviously analogous to the same bones

* From 84 to 95 upper, from 84 to 95 lower teeth, all of which are regarded as molars.

in the human subject, or in other animals, as to be recognised almost at a glance. The construction of the blow-hole, or breathing apparatus, is also well worthy the peculiar attention of the observer who may have an opportunity of examination, on account of its remarkable excellence of adaptation, and the delicacy of its construction.

The colour of the true dolphin is of a black or blackish green on the upper surface, and on the inferior parts of a light gray or whitish. There is below the eye, on each side, a whitish ray or blaze extending towards the humeral fins.

SPECIES II.—*Gladiator Dolphin.*

Delphinus Gladiator.

- Schwertdt fisch*: ANDERSON, Island, p. 155.
Poisson à Sabre: PAGES, Voyage au Pole Nord. ii. p. 142.
Delphinus dorsi pinna altissima, & MULLER, Zool. Dan. Prod. p. 8. n. 57.
Delphinus Maximus: OLAFSEN, voy. en Islande.
Dauphin Epée de Mer: BONNAT. Cetol, sp. 5, p. 23.
Dauphin Gladiateur: LACEP. Hist. Nat. des Cétacés, 302, pl. 5, fig. 3.
Dauphin Espadon: DESM. Mammal. sp. 773, p. 517.

This dolphin was first described by Anderson in the work above quoted, and we have very little knowledge of it, except what is derived from him. The head of the gladiator is not highly arched above, but is gradually tapering towards the snout, which is short and as if truncated. Its mouth is furnished with small pointed teeth. Its most remarkable characteristic is a dorsal fin, which is three or four feet high, by eighteen inches wide at its base, slender towards its summit, and recurved towards the tail. Mariners believe that this fin is employed by this dolphin in attacking the whale; but Anderson states "that it is rather the mouth of the animal that is dangerous. As they commonly swim in small troops, they attack the whale in a body, and tear off great pieces of his flesh, until becoming excited to a certain degree, he thrusts out his tongue, when they immediately fasten on this organ and devour it, and finally, gaining access to his mouth, they destroy the life of the animal." Bonnaterre remarks that the same author thinks with reason that the cetaceous animals called *Killers*, on the coasts of New-England, are of this species. In fact, they have both jaws furnished with teeth which interlock, have on their backs a fin four or five feet high, swim in troops, and attack in a body young whales, just as a pack of dogs attack a bull. Some seize the whale by the tail to prevent him from using this weapon of de-

fence, while the others attack and bite him about the head until the unwieldy creature becomes fatigued, and thrusts forth the tongue as already stated.

The gladiator dolphin is found on the coasts of Spitzbergen in Davis's straits, and on the New-England coasts. The Chevalier Pages, on his voyage towards the north pole, found them about the 79th degree of latitude. "The sabrefish," says he, "are also found among the ice, but they rarely quit the frozen climate near the pole. They are from twenty-three to twenty-five feet long; they are black, and carry their sabre perpendicularly upon the back; this sabre is curved backwards, and is about four feet long. I have seen whales fly from them with the utmost celerity, and I have seen others deeply scarred by the weapon of this warlike animal."*

SEIES III:—*The Sea-Swine.*

Delphinus Phocæna; L.

Delphinus Phocæna: BRISS. Règne An. 371, No. 2.

Dauphin Marsouin: LACEP. Cet. 284, pl. 13. fig. 2.

Dauphin Marsouin: BONNATERRE, Cétol. p. 18, sp. 1.

[Called by the English *Porpus*: by the Dutch *Bruinvisch*; in German *Meerschwein*; by the French *Marsouin*.]

We give an account of this species in this place, because authors are in the habit of ranking it among those which frequent our coasts. But we have not been able at any time to learn that the sea-swine has been seen in our waters, or that any other species than those already mentioned are known to our fishermen. The dolphin first described, or true dolphin, is the species universally known by the name of *porpus*† in this country, and is at once distinguishable from the European *porpus*, or sea-swine, by its elongated flattened beak; the latter having a blunt snout, without any beak. If it ever is seen on our coasts, it must be very rare, as we have been thus far unable to find any one who has seen it, except in the seas bordering the shores of Europe. We therefore introduce the description of the species from BONNATERRE, in order that

* Op. cit. apud Bonnaterre *Cetologie* ut supra.

† *Porpus* is a corruption of *pore-poisson*, as the French *marsouin* is of the German *meerschwein*.

those who have opportunities of observation may be able to compare the animals and settle the question.

The body of the sea-swine is conical, having a triangular fin on the back. The snout is pointed, and the teeth rounded, trenchant, and enlarged at their summits. The body of this animal is round, thick, and tapering towards the tail. The head represents an obtuse cone, which is much arched above the orbits of the eyes: it thence gradually tapers down to the snout. The eyes are situated opposite the opening of the mouth: the pupil is black, surrounded with a white iris. Both jaws are nearly of the same length; the lower one being armed on each side with a range of small teeth, which are slender at the base, flattened, trenchant, and rounded at the summit; varying in number from fifty to fifty-five. Behind the eye is a small round hole, an inch in diameter; this is the ear. The blow-hole is situated upon the summit of the head, in the centre of the interval between the eyes and angles of the mouth. The nostrils are placed between the blow-holes and the extremity of the muzzle. The lateral fins are placed upon the borders of the lower surface of the body: the dorsal fin occupies the middle of the back. Behind this fin the back is flattened and raised in the middle by a projection which extends entirely to the caudal fin. On the part of the belly corresponding to the dorsal fin, there is a depression which conceals the sexual organs. The vent is equi-distant from the depression and the caudal fin. The caudal fin is formed of two lobes rounded at the points, and slightly grooved. The colour of the whole superior surface is of a blackish blue: the belly whitish. The length from six to eight feet.

This animal which is considered an excellent swimmer, habitually carries the head and tail curved downwards, and in consequence, shows nothing but the back when it comes to the surface to breathe; but as soon as it is dead, it extends itself in a straight line. They feed on small fish, which they pursue with inconceivable swiftness. The sea-swine are almost always seen in troops, especially in their sexual season, which is in the month of August. It is then common to see ten or fifteen males in pursuit of a single female, and they press on with so much ardour, that they are often stranded on the beach before they are aware of their situation. The young are carried ten months; only one is brought forth at a time. An embryo, extracted from the mother by Klein, was about twenty-one inches long. The young one constantly follows the mother until weaned.

The flesh of this animal is oily and disagreeable. The

Laplanders, Greenlanders, and others eat it. In some parts of the world they are killed for the sake of their oil and skins.

Fabulous History of the Dolphin.

Few animals have occupied a more distinguished place in the writings of historians and poets, than the dolphin, whose actual habits and manners we have just examined. From Herodotus, the father of Greek historians, down to a comparatively recent period, we find a succession of wonderful incidents related, originating either from the most inaccurate observation of fact, or from the wildest extravagance of fancy.

It will be an amusing, and we hope not an un instructive lesson, to trace some of the most remarkable of these stories, both to show how far the human mind may permit itself to be misled, and to set at rest, by exposing their futility, such recitals as the beauty and excellence of poetry tend to perpetuate as probable or true. Investigations of this kind may in some degree lessen the pleasure derived from the works of fiction, but the advantage of being possessed of the truth, far outweighs the temporary gratification arising from an indulged imagination.

The most ancient of the accounts given of the docility and friendly disposition of the dolphin, is that related of Arion, by Herodotus in his first book. As this may be considered the source from which most of the others have sprung, we subjoin a free translation from the venerable historian.

"Periander was king of Corinth. The Corinthians relate, (and the Lesbians agree with them,) that during his life-time, a great prodigy occurred. They say that Arion was carried from Methymna to Tænarus upon the back of a dolphin: as a musician, he was second to none, as a dithyrambist, we know he was the first, composing, giving rules and teaching at Corinth. Having spent much of his time with Periander, he desired to visit Sicily; having acquired much wealth there, he wished to go back to Corinth, for which purpose he hired a vessel from some Corinthians at Tarentum. When at sea, they conspired to throw him overboard, that they might share his money; which having learned, he earnestly besought them to take his wealth, but spare his life. But they, unmoved by his entreaties, ordered him either to kill himself, and perchance obtain a burial on shore, or to cast himself instantly into the sea.

"Driven to despair, Arion besought them, since it was thus determined, that they would allow him to sing, standing com-

pletely arrayed on the deck. They promised him that he might die singing, and pleased that they should hear the most excellent of musicians, they removed from the poop towards the middle of the ship. Arion, clad in his professional robes,* took his lyre, and, standing on the deck, ran through the Or-thian measure.† Having concluded, he threw himself into the sea, and they sailed on from Corinth. But Arion, sitting on a dolphin's back, was conveyed to Tænarus, &c. &c. These things are still told by the Corinthians and Lesbians. There is a small brazen votive tablet of Arion near Tænarus, of a man mounted upon a dolphin's back.‡

The sagacious and judicious Plutarch not only repeats this story, but introduces Gorgias in the conversation of the seven wise men, as saying that he knew Arion before he landed from off the dolphin's back, because he had on the dress he had worn at the public games. Aulus Gellius repeats the story from Herodotus, as it was originally told, and Ovid perpetuates it in verse.§

* *Ἐν τῇ σευῆν πάσῃ* is rendered by Dalzell, "completely arrayed," as we have given the phrase in the second paragraph. Murphy says it was not his ordinary dress he wished to die in, but one peculiar to him as a musician.

† So called, because sung at the highest and strongest pitch of the voice. "*Ὀρθιον* enim Græci dicunt quod arduum est, et quam altissima voce elevatum.—*Gesnerus*."

‡ Herodotus, *ἐκ τῆς Κλειους*.—This story did not escape the biting irony of Lucian, whose talent for ridicule has rarely been surpassed.—He has a dialogue between Neptune and the very dolphin who bore Arion in safety to Tænarus, and makes him repeat Herodotus's story, as "having heard the whole of it while swimming round the ship."—Lucian also accounts for the fabled attachment of the Dolphin to the human race, by making this one remind Neptune that they were changed from *men* to dolphins by Bacchus. Ovid relates the transformation in his third book of *Metamorphoses*, where Bacchus himself in the semblance of his companion Actæes, is the speaker:—

"At Lybis obstantes dum vult obvertere remos,

In spatium resiliere manus breve vidit; et illas
Jam non esse manus jam primas posse vocari.
Alter ad intortos cupiens dare brachia funes
Corpore desiluit; *falcata novissima cauda est*
Qualia dimidiæ sinuantur cornua luncæ."

§ Ille metu vacuus, mortem non deprecor inquit;

Sed liceat sumta pauca referre lyra.

Dant veniam, ridentque moram: capit ille coronam,

Quæ possit crines, Phœbe, decere tuos.

Induerat Tyrio bis tinctam murice pallam:

Reddidit icta suos pollice chorda sonos;

Flebilibus veluti numeris canentia dura

"Numerous examples, (says Aristotle,) of the gentleness and mild manners of dolphins are related. About Tarentum, Caria and other places, they tell of their love and regard for boys. A dolphin having been wounded near Caria, a troop of dolphins, it is said, gathered in the port, until the fisherman set his prisoner at liberty, when they all went off. A large dolphin likewise always accompanies them as a guard. A troop of dolphins of larger and smaller size were once seen, and, at no great distance behind them, two dolphins appeared, bearing up the body of a young dead dolphin on their backs, by swimming beneath it, as if induced by pity lest it should be devoured by some beast.*

Celian relates in the third chapter of his eighth book, that Ceranus, the Parian, purchased the freedom of some dolphins caught by Byzantine fishermen, and afterward sailed towards his own country in a Milesian vessel of fifty oars. His vessel was cast away in the strait of Paros, but these dolphins which he had set at liberty, came in time to save their deliverer, and landed him on a promontory, subsequently called Cerania, in honour of him; at his death, he requested to be interred at that place; thither the dolphins went to pay their benefactor merited funeral honours.

Leonidas of Byzantium narrates (in Celian's second book, ch. 6.) that a man and his wife of Pleroselene, taught a dolphin to eat from their hands, and accustomed their son to be very familiar with the animal, which very regularly frequented the harbour of the town, appearing to regard it as his home. When old enough to take care of himself, he sought his subsistence at sea, and brought a share of his success in fishing daily to his friends. The parents had given the same name to the dolphin and their son. When the boy sat upon a projecting rock, and called his friend, the dolphin immediately hastened towards him, testifying his pleasure by his frolicsome movements. This connexion between the boy and

Trajectus penna tempora cantat olor.
 Protinus in medias ornatus desilit undas,
 Spargitur impulsa cœrula puppis aqua.
 Inde, fide majus tergo Delphina recurvo
 Se memorant oneri supposuisse novo.
 Ille sedens citharamque tenet, pretiumque vehendi
 Cantat, et æquoreas carmine mulcet aquas.
 Di pia facta vident: astris Delphina recepit
 Jupiter, et stellas jussit habere novem.

* Aristoteles de Animalibus Historiæ, lib. ix. cap. 35.

dolphin, occasioned a great deal of rumour, and was very profitable to the parents.*

The younger Pliny, however, exceeds all these wonders, by the following recital. A scholar, named Hippus, in the time of Augustus, who attended a class at Puzzoli, was in the habit of going daily along the shores of Baia, and about mid-day, of stopping and throwing pieces of bread into the water to a dolphin. If the youth called the dolphin at any time, he would immediately come, and after eating his bread, would offer his back for the use of his friend, who would mount thereon, and he would swim with him to Puzzoli, and afterward carry him back in the same manner. This friendly intercourse was maintained for several years; but the boy dying, the afflicted animal came frequently to the accustomed place, remained there sorrowful and wretched, and finally died of grief!†

The reasons for believing the present species to be the dolphin of the poets, are the following: first, it is the only dolphin which is known habitually to frequent the coasts, or to visit the deep bays which extend far inland. The sea-swine (meerschwein, marsouin, *Delphinus Phocæna*,) have no beak extending beyond the arched part of the head, and as they are seldom seen except in the full sea, are not likely to have afforded much opportunity to the ancients for examination. That they were well acquainted with our dolphin, we have the most excellent evidence, in the figure of the one which accompanies the statue of the Venus de Medicis. Although the usual poetical license has been taken by the sculptor, of placing the animal resting on the under jaw and neck, with its body and tail raised in fanciful undulations, from the great resemblance of the head and beak to those of the dolphin we have been examining, in conjunction with the circumstances of its habits, numbers, and familiarity with the bays and rivers of almost all the world, we are persuaded of the identity of the species frequenting our waters, with that to which all the ancient fables relate.

We have thought it unnecessary to bring the fabulous history of the dolphin down to a later period than that of Pliny, as all the subsequent stories appear to be variations of the same. It is impossible, however, not to feel sorry that some

* There is nothing improbable in the dolphin's obedience to a certain call from one accustomed to supply it with food. Animals of very inferior rank to the dolphin may be taught as much. The improbability is in the gratitude of the animal, evinced by the offer of part of his fish.

† See Pliny, lib. ix. cap. viii.

FABULOUS HISTORY, &c.

works of great authority and usefulness, continue to be so much of what is barely *possible*, with the little interest in regard to this and other animals, as to give fable to the whole.

Following from the "Nouveau Dictionnaire d'Histoire," may serve as an instance.

Dolphins form among themselves a sort of society ; and those of the troop that may be attacked, and utter cries, in order to induce the aggressors to release the little dolphins are placed in the middle of the large and most robust at its head : they all prefer order like a battalion of soldiers ; they swim each in its rank ; the females compose the rear guard, and urge the stragglers.*

It is not the only passage of the kind that might be seen in the article on the dolphin, in the same work. If we shall ever arrive, when the facts of natural history are without admixture with fable, the world will be more satisfactorily advanced in improvement than can be hoped for, so long as imagination is permitted to take the place of truth. The latter, like perfect beauty, is a kind of adornment, and is always more admirable in



Fig. 1.



Male Narwal, or Unicorn.

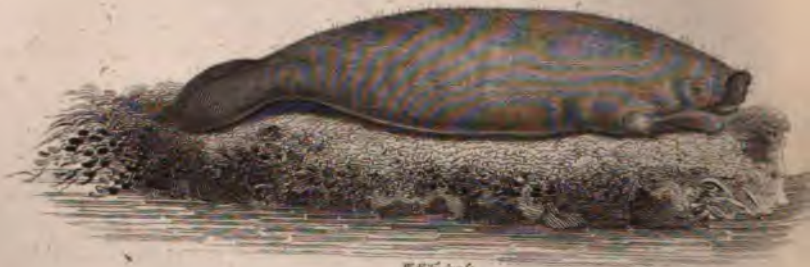
15 Ft. in length.

Fig. 2.



Under side view of the same Narwal.

Fig. 3.



W. E. Fisher, Sc.

Lamantin.

CHAPTER XVIII.

GENUS NARWAL ; *Monodon* ; L.

GENERIC CHARACTERS.

GENERAL form of the body similar to that of the dolphin ; a single spiracle or blowhole on the superior part of the head ; mouth small ; no teeth within the mouth, one long spiral tusk growing from the intermaxillary bone ; dorsal crest or spine, instead of a fin. The eyes and ears small.*

SPECIES I.—*The Narwal.*

Monodon Monoceros ; L.

Monodon Narwal : FABRICIUS, Faun. Greenl. 29.

Narwal oder einhorn : ANDERSON, Island. 223.

Narwal : BONNAT. Cétol. : 10.

Narwal Vulgaire : LACEP. Hist. Nat. des Cétacés, 142.

Narwal, or Unicorn of the Whalers ; SCORESBY, Arct. Regions, i. 486. *IBID.*

Voyage to Greenland, 129.

[Commonly called *Sea-Unicorn.*]

The narwal is an inhabitant of the arctic seas, and consequently is seldom seen, except by the adventurous mariners, who seek the spoils of the whale amid the perils of polar ice and storms. Fortunately, however, some few of these, incited by hopes of gain to visit those forbidding regions, have been well qualified to make accurate scientific observations, and owing to their zealous industry, we have actually less to desire concerning the animals found in the icy seas, than in relation to many others, almost within the reach of every observer.

Among the individuals to whom science is most deeply indebted, the name of SCORESBY must ever stand conspicuous ; few persons have contributed so largely to the advancement of natural history, while engaged in ordinary commercial pur-

* "Penis vaginatus ; mammæ lactantes binæ et genitalia feminarum sub abdomine ; pone illa anus."—*Bonnat.*

suits, and still fewer have effected the object so well under any circumstances. His mind appears to have been one of that rare, but amiable compositions, in which genius, talent, energy and sound common sense, are blended in such just proportion, as to be capable of operating at all times, and upon all materials to the greatest possible advantage. From his valuable researches we shall derive almost all the observations which remain to be made upon the cetaceous animals, claiming for ourselves no other merit than that of having collected and arranged them.

The vertebral column of the narwal is about twelve feet long; there are seven cervical, twelve dorsal, and thirty-five lumbar and caudal vertebræ, being in all fifty-four; twelve of which enter the tail and extend to within an inch of its extremity. The spinal marrow runs through all the vertebræ, from the head of the fortieth, but does not penetrate the forty-first. The spinous processes diminish in length from the fifteenth lumbar vertebræ, until it is scarcely perceptible at the nineteenth. Large processes, attached to two adjoining vertebræ, and arising from the inferior surface of the bodies of the vertebræ, commence between the thirtieth and thirty-first, and terminate between the forty-second and forty-third. There are twelve ribs, six true and six false, on each side, which are slender for the size of the animal. The sternum is heart-shaped, with the broadest part anteriorly. Two of the false ribs, on each side, are joined by cartilages to the sixth true rib, the others are detached.

The narwal, when full grown, measures from thirteen to sixteen feet in length, exclusive of the tusk, and at the thickest part, which is two feet behind the fins, the circumference is about eight or nine feet. The part of the body anterior to the fins and head are paraboloidal; the middle portion of the body is almost cylindrical, the posterior portion, to within three or four feet of the tail, is somewhat conical; thence a ridge commencing both at the back and belly, the section becomes first an ellipse, and then a rhombus at the junction of the tail. The perpendicular diameter, at a distance of twelve or fourteen inches from the tail, is about one foot, the transverse diameter is about seven inches. The back and belly ridges, run half way or more across the tail; the edges of the tail run in the same way along the body, and form ridges on the sides of the rump. Posterior to a very slight elevation at the spiracle, the outline of the back forms a regular curve; the belly appears to rise, or is contracted near the vent, and expands to an obvious bump, about two feet anterior to the genitals. The back

appears depressed and flat three or four feet posterior to the neck.

The head forms about one seventh of the whole length of the animal, being small, blunt, and round. The mouth is small, and incapable of much extension, having a wedge-shaped underlip. The eyes are only one inch in their largest diameter, and are placed on a line with the opening of the mouth, at about thirteen inches from the snout. The opening of the ear, situated six inches behind the eye, on the same horizontal line, is of the diameter of a small knitting needle. The skull of the narwal, like the dolphin, &c. is concave above, and sends forth a large, flat, wedge shaped process in front, which affords sockets for the tusks. There is upon this process a bed of fat extending horizontally to the thickness of ten or twelve inches, and eight or ten perpendicularly. To this fat the roundness of the head is owing, and according to the quantity present, is the prominence of the front, and the variation of the facial angle, from 60 to 90 degrees.

The spiracle or blowhole is situated immediately over the eyes, and is a single semicircular opening, about three and a half inches in diameter and one inch and a half in length. It expands immediately within the skin into a sac or air vessel, six or eight inches wide, and extending laterally and forward into two cavities, one on each side; the extremities of which are about twelve inches apart. These contain some mucous matter; the lining of the whole sac is a thin, greenish, black membrane. At the posterior extremity of the sac the blow-holes are seen, divided there into two distinct canals in the skull. They are closed by a valve resembling a hair lip, one lobe of which covers each canal. This valve in the narwal does not, (as in the whale) enter the canal in the skull, but merely closes down upon it. It, however, effectually excludes the sea-water from the lungs, whatever be the pressure; it becomes, in fact, firmer and closer, in proportion as the weight of water is increased. The valve is about six inches wide, and is closed and opened by two radiated muscles. It is detached from the skull beneath, about six inches towards the snout. In consequence of this separation, the valve is sufficiently free, and has room enough in the adjoining sac to be drawn upward and forward, so as to expose the breathing canals, or falling upon them like the valve of a pump-box, to secure them against the entrance of water. The two lobes of the valve are connected by a fleshy septum, slightly attached to the cartilaginous part of the bony partition between the blow-holes in the skull.

The fins are twelve or fourteen inches long, and six or eight

broad, and placed at one-fifth of the length of the animal from the snout. Where fixed to the body, the fin is elliptical, its longest axis lying longitudinally, so that when the fin is elevated to the swimming position, it is horizontal, the point or tip is bent upwards or towards the back, consequently, when the fin is in the swimming position, it is concave above and convex below, the thick edge forward and the thin edge towards the tail. The fin being horizontal, is evidently designed to balance the animal, while the tail, which is from fifteen to twenty inches long, and three or four feet broad, is the chief organ of motion, and is also used in turning. That the fins are not commonly used either for swimming or turning, appears probable from repeated observations made with a telescope from the mast head. The fins were always seen steadily extended, and when the animal changed its direction, the tail was bent suddenly and obliquely to one side, and then slowly brought back, so that the progressive motion and change of direction were produced by the same effort; the fin at the same time remaining motionless.

The general colour of the young narwal is blackish gray on the back, variegated with numerous darker spots running into each other and forming a dusky black surface, paler and more open spots of gray on a white ground at the sides, disappearing altogether about the middle of the belly. In the elder animals, the ground is wholly white, or yellowish white, with dark gray or blackish spots of different degrees of intensity. These spots are of a roundish or oblong form: on the back, where they seldom exceed two inches in diameter, they are the darkest and most crowded together, yet with intervals of pure white among them. On the sides, the spots are fainter, smaller and more open. On the belly they are extremely faint and few, and being in considerable surfaces, are not distinguishable. A close patch of brownish black, without any white, is often found on the upper part of the neck, just behind the blowhole: the external part of the fins is also generally black at the edges, but grayish about the middle. The superior side of the tail is also blackish around the edges: but in the middle, gray with black curvilinear streaks, on a white ground, forming semicircular figures on each lobe. The inferior surfaces of the fins and tail are similar to the upper, only much paler coloured, the middle of the fins being white, and of the tail a pale gray. The sucker narwals are almost uniformly of a bluish gray or slate colour. Very old individuals become almost white.

The skin of the narwal resembles that of the whale, except that it is thinner. The cuticle is about as thick as writing

paper; the rete mucosum three-eighths or three-tenths of an inch thick; the cutis thin, but strong and compact on the outer side.

We may next consider the most remarkable peculiarity which distinguishes this animal; the long spiral tooth or tusk, which has obtained for it the name of UNICORN. This tusk grows from the left side of the head, and is sometimes nine or ten feet long. EGEDE, in his description of Greenland, describes this tusk as being fourteen or fifteen feet long. It projects from the inferior part of the upper jaw, and points forward and slightly downward, being parallel in direction to the roof of the mouth. It is spirally striated from right to left, nearly straight, and tapers to a round blunt point. It is of a yellowish white colour, and consists of a compact kind of ivory, and is usually hollow from the base to within a few inches of the point. A tusk of the average length, five feet, is about two inches and a half in diameter at the base; one inch and three-fourths in the middle, and about three-eighths within an inch of the end. In such a tusk there are five or six turns of the spiral, extending from the base to within six or seven inches of the point. Beyond this the end is not striated, but smooth, clean, and white; the striated part is usually gray and dirty. The tusk is commonly covered with a greasy blackish brown incrustation over the greatest part of its surface; the under part and a few inches of the point are kept quite clear and polished by some use which prevents the adherence of the matter just mentioned. A horn externally of seven feet in length, is bedded about fifteen or sixteen inches in the skull. All the male narwals, killed by Scoresby, excepting one, had tusks of from three to seven feet in length, projecting from the left side of the head.

In addition to this external tusk, peculiar to the male,* there is another on the right side of the head about nine inches long, imbedded in the skull. In females as well as in young males, in which the tooth does not appear externally, the rudiments of two tusks are generally found in the upper jaw. These are entirely solid, and are placed back in the substance of the skull, about six inches from its most promi-

* Scoresby, in his Greenland voyage, killed a female narwal, having an external horn, four feet three inches long; twelve inches of which were imbedded in the skull. It had also a milk tusk, as is usual, nine inches long, which was of a conical form and obliquely truncated at the thicker end, and without the knob found in many of the milk tusks. The horn was on the left side of the head, and the spiral was *dextrorsal*.

nent part. These rudiments of tusks are eight or nine inches long, both in male and female; in the former they are smooth, tapering, and terminate at the root with an oblique truncation; in the latter, they have an extremely rough surface, and finish at the base with a large irregular knob placed towards one side, which gives the tusks something of the form of pocket-pistols. Two or three instances have occurred of male narwals having been taken, which had two external tusks. This is a rare circumstance, and it rarely or never occurs that an external horn is found on the right side.

What purpose this singular and formidable tusk can serve, is not easily to be determined. It is not essential to the defence of the animal, or else the young and a vast majority of the females would be left unprotected. It has been suggested, that it is employed by the animal in piercing thin ice for the convenience of rising to respire, and that it is occasionally employed in killing prey. But nothing has yet been observed, sufficient to enable us to draw any positive conclusion on the subject.

The food of the narwal appears to be principally molluscous animals, such as the cuttle-fish, &c., but judging by the materials occasionally found in their stomachs, more substantial food is frequently devoured by them. In the stomach of one examined by Scoresby, besides the beaks and other remains of cuttle-fish, there was part of the spine of a *pleuronectes*, or flat-fish, probably a small turbot; fragments of the spine of a *gadus*; the backbone of a *raia*, with nearly a whole skate, *raia-balis*, which was two feet three inches long, and one foot eight inches broad. That an animal having no teeth except the external tusk, a small mouth, and a tongue incapable of protrusion, should be able to swallow a fish nearly three times as great as the width of its own mouth, is really surprising. Scoresby inclines to the opinion, that the skates had been pierced with the horn, and killed before they were swallowed by the narwal, as it is otherwise very difficult to conceive how an animal so large as the skate, would allow itself to be sucked down the throat of a smooth-mouthed animal, having no means of crushing or detaining it.

The narwal is a harmless animal, of an active disposition, and swims with considerable swiftness. When at the surface, for the sake of respiring, these animals frequently lie motionless for several minutes, with their heads and backs just appearing above water. Occasionally, numerous small herds are seen together, each herd generally consisting of individuals of the same sex.

The narwal is sometimes shot with a rifle, kept for that

purpose in the *crow's-nest* of the whaling ships. When harpooned, the narwal dives as swiftly, but not so deeply as the common whale. It commonly descends about two hundred fathoms, and then returns to the surface, where it is soon killed with lances.

The whole body of the narwal is covered by a layer of blubber immediately beneath the skin, which is from two to three inches thick, and yields a considerable quantity of fine oil. The Greenlanders and Esquimaux employ the whole animal to various uses. The flesh is eaten, the oil burned in their lamps, the intestines wrought into lines and dresses, and the tusks are used for spears, &c. It is said that the king of Denmark has a magnificent and valuable throne made entirely of narwal tusks.

The following are the dimensions of a male narwal, killed by Scoresby, near Spitzbergen, in 1817 :

	Feet.	Inches.
Length, exclusive of the tusk, : : :	15	0
— from the snout to the eyes, : : :	1	1½
— fins, : : :	3	1
— backridge, : : :	6	0
— vent, : : :	9	9
Circumference, 4 1-2 inches from snout, : : :	3	5
— at the eyes and blowhole, : : :	5	3½
— just before the fins, : : :	7	5
— at the fore part of backridge, : : :	8	5
— at the vent, : : :	5	8
Tusks, length externally, : : :	5	0½
— diameter at base, : : :	0	2½
Blowhole, length 1½ inch. breadth, : : :	0	3½
Tail do. 14 do. : : :	3	0½
Fins do. 13 do. : : :	0	7½

Heart weighed 11 pounds. Temperature of the blood an hour after death, 97°.

A fine specimen of the tusk or horn of the narwal may be seen in the Philadelphia Museum.

CHAPTER XIX.

SECTION II.—*Size of the head disproportioned to that of the body.*

GENUS CACHALOT: *Physeter*: L.

GENERIC CHARACTERS.

THE head in these animals is of huge size, forming a third, or even half of their entire length. The upper is broad, high, destitute of corneous fringes and teeth, or having short teeth, almost entirely concealed within the gums. The lower jaw is elongated, narrow, and armed with thick conical teeth, which fit into corresponding depressions in the upper jaw. The spiracles are placed at or near the extremity of the superior part of the snout. There is a dorsal fin in some species, in others merely an eminence. In the superior parts of the head there are large cavities, circumscribed by cartilaginous partitions, and communicating with different parts of the body by particular canals. These are filled with an oil that becomes fixed and crystallized on cooling, and is the well known substance spermaceti.

The teeth are ovoid and recurved; externally they somewhat resemble ivory, internally they are softer, and ash coloured. They are commonly about six inches long, and three in circumference at the base, and are thought to become larger and more recurved as the animal grows. The upper jaw has as many alveolar depressions as there are teeth in the lower, but what is most remarkable, is, that in the interstices separating these depressions, are to be found about twenty small teeth, horizontally placed, and raised about one-twentieth of an inch above the gum. These teeth are acutely pointed, and present a flat, even and oblique surface, filling the intervals separating the alveoles. This oblique surface is all that is seen of them, the other parts of these teeth being imbedded in the gum.*

* See Desmarest's *Mammalogie*; Bonnaterre *Cétologie*; Sibbald *Phalainologia nova*.

SPECIES I.—*The Spermaceti Cachalot.*

Physeter Macrocephalus.

Le Grand Cachalot: BONNAT. Cetol. 12.*Cachalot Macrocephale*: DESM. Mam. 524. p. 790.*Cachalot Macrocephale*: LACEP. Hist. Nat. des Cétacés, pl. 10.

The spermaceti cachalot is found in greatest abundance in the Pacific Ocean, where large numbers of them are annually killed by the American and other whalers for the sake of their oil and spermaceti.

The spermaceti cachalot is gregarious, and herds are frequently seen containing two hundred or more individuals. Such herds, with the exception of two or three old males, are composed of females, who appear to be under the direction of the males. The males are distinguished by the whalers as *bulls*; the females they call *cows*. The bulls attack with great violence, and inflict dreadful injuries upon other males of the species which attempt to join their herd. These animals live separately, while young, according to their age and sex. The young and half grown males are found by themselves; the old *cows* protect the young females. When the young bulls attain sufficient strength, they venture into a herd under the protection of some old bulls, an intrusion that is said to produce a severe contest, by which they succeed in gaining admittance to, or are driven from the herd.

The mode of attacking these animals is as follows:—Whenever a number of them are seen, four boats, each provided with two or three lines, two harpoons, four lances, and a crew of six men, proceed in pursuit, and, if possible, each boat strikes or “fastens to” a distinct animal, and each crew kill their own. When engaged in distant pursuit, the harpooner generally steers the boat, and in such cases the proper boat steerer occasionally strikes, but the harpooner mostly kills it. If one cachalot of a herd is struck, it commonly takes the lead and is followed by the rest. The one which is struck seldom descends far under water, but generally swims off with great rapidity, stopping after a short course, so that the boat can be drawn up to it by the line, or be rowed sufficiently near to lance it. In the agonies of death, the struggles of the animal are truly tremendous, and the surface of the ocean is lashed into foam by the motions of the fins and tail. Tall jets of blood are discharged from the blowholes, which show that the wounds have taken mortal effect, and seeing this, the boats are kept aloof, lest they should be dashed to pieces by the violent efforts of the victim.

When a herd is attacked in this way, ten or twelve of the number are killed; those which are only wounded are rarely captured. After the cachalot is killed, the boats tow it to the side of the ship, and if the weather be fine, and other objects of chase in view, they are again sent to the attack.

The separation of the blubber from the animal, or "flensing," is sometimes done differently from the manner used in the polar whaling. A strap of blubber is cut in a spiral direction, and being raised by tackles, turns the cachalot round as on an axis, until nearly all the blubber is stripped off. The material contained within the head, consisting of spermaceti mixed with oil, being in a fluid state while warm, is taken out of large cachalots in buckets, while the animal remains in the water; but in smaller ones, the part of the head containing the spermaceti, is hoisted upon deck before the cavity is opened.

The substances taken from the head, congealing as soon as cold, the compound is thrown in its crude state into casks, and is purified at the end of the voyage on shore. The oil is reduced from the blubber shortly after it is on board, in "try works," with which the ships engaged in this business are always provided. There are two coppers in the try works, placed side by side, near the fore hatch. These, with their furnaces and casing of brickwork, occupy a space of five or six feet in length, by eight or nine in breadth, (or fore and aft—and athwart ship,) and four or five feet in height. The cavity of the brick arches sustaining the coppers and furnaces, forms a water cistern, so that while the fire is burning, the deck is secured from injury by the changing of the water in the cistern twice or thrice in every watch. As the oil is extracted it is thrown into coolers, whence, after about twenty-four hours, it is transferred to casks. At first the coppers are heated with wood, but afterward the cracklings or fritters of the blubber, which still contain some oil, are employed as fuel, and produce a fierce fire. About three tons of oil are commonly obtained from a large cachalot of this species; from one to two tons are procured from a small one. A cargo, produced from one hundred cachalots, may be from 150 to 200 tons of oil, besides the spermaceti, &c.



BALÆNA MYSTICETUS, or COMMON WHALE.

58 Feet long.

The Mouth being open shows the position of the Whalebone.



Wale, one-tenth of inch to a foot.

Drawn by W. S. S. S. S. S.

W. S. S. S. S.

CHAPTER XX.

GENUS—WHALE; *Balena*; L.

GENERIC CHARACTERS

WHALES possess no true teeth; the upper jaw resembles the keel of a vessel, or the roof of a house reversed. It is furnished on each side with transverse horny layers of a peculiar substance, called *Baleen*, which at the edges are split into long slender fringes. The spiracles or blowholes are separated, and placed about the middle of the superior part of the head. Some species have a dorsal fin; others merely a prominence.

SPECIES I.—*The Whale*.

Balena Mysticetus; L.

Φαλαίρα; ARIST. AN. I. c. v. III. c. xvi. Μυστικητος, IB. III c. x. *Æt.* Hist. AN. V. c. iv.

Hawalfisch; EGEDE, Greenland, 48.

La Baleine Franche; BONNAT. Cétol. 1.

The Common or Greenland Whale; SCORESBY, Arct. Regions, i. 449.

In attempting to describe a creature so gigantic and surpassing in strength as the whale, we deeply feel the want of expression suitable to our purpose, and vainly endeavour to remove this difficulty by resorting to comparisons scarcely less inadequate, or conveying at best but vague and unsatisfactory ideas. The sublime in magnitude among organized and animated beings, the whale is adapted in all his attributes to the fathomless and illimitable waters he is destined to inhabit: contrasted with other animals, his strength as far transcends their greatest exertions, as the irresistible heavings of the mighty deep exceed the harmless rippling of a sylvan stream. It is only by successive approaches and detailed examination that we can arrive at a proper conception of this animal, and, therefore, the statements which are freest from attempts to emulate by ambitious style the magnitude of the subject, will lead us to the most satisfactory conclusions.

Having never personally enjoyed opportunities of studying

the whale in his native floods, and having derived all that we know in relation thereto from SCORESBY, we should deem it injustice to the reader to give this account in any other language than that of the original. We do this without reluctance, as our object is to convey the most accurate knowledge, rather than to produce a work exclusively of our own composition, and because we believe that where an original observer is competent to express what he has seen, his remarks must have a force and value far greater than can be imparted by another, however great may be his command of language, or his felicity of expression. All that follows in relation to the whale, is selected from the different works of the accurate and philosophical SCORESBY.

The Whale

This valuable and interesting animal, generally called the whale by way of eminence, is the object our most important commerce to the polar seas—is productive of more oil than any other of the cetacea, and being less active, slower in its motion, and more timid than any other of the kind, of similar or nearly similar magnitude, is more easily captured.

Large as the size of the whale certainly is, it has been much over-rated; for such is the avidity with which the human mind receives communications of the marvellous, and such the interest attached to those researches which describe any remote and extraordinary production of nature, that the judgment of the traveller receives a bias, which, in case of doubt, induces him to fix upon that extreme point in his opinion, which is calculated to afford the greatest surprise and interest. Hence, if he perceives an animal remarkable for its minuteness, he is inclined to compare it with something still more minute: if remarkable for its bigness, with something fully larger. When the animal inhabits an element where he cannot examine it, or is seen under any circumstances which prevents the possibility of his determining its dimensions, his decision will certainly be in that extreme which excites the most interest. Thus a mistake in the size of the whale would easily be made; and there is every probability of such an error having been committed two or three centuries back, from which period some of our present dimensions have been derived, when we know that whales were usually viewed with superstitious dread, and their magnitude and powers in consequence, highly exaggerated. Besides, errors of this kind having a tendency to increase rather than to correct one

another, from the circumstance of each writer on the subject being influenced by a similar bias, the most gross and extravagant results are at length obtained. Thus authors, we find, of the first respectability in the present day, give a length of 80 or 100 feet, or upwards, to the mysticetus, and remark with unqualified assertion, that when the captures were less frequent, and the animals had sufficient time to attain their full growth, specimens were found of 150 to 200 feet in length, or even longer; and some ancient naturalists, indeed, have gone so far, as to assert that whales had been seen of above 900 feet in length.

But whales, in the present day, are by no means so bulky. Of 332 individuals, in the capture of which I have been personally concerned, no one I believe exceeded 60 feet in length; and the largest I ever measured was 58 feet from one extremity to the other, being one of the longest, to appearance, which I ever saw. An uncommon whale, which was caught near Spitzbergen, about twenty years ago, the whalebone of which measured almost fifteen feet, was not, I understand, so much as 70 feet in length; and the longest actual measurement that I have met with, or heard of, is given by Sir Charles Giesecke, who informs us, that in the spring of 1813, a whale was killed at Godharn of the length of 67 feet; these, however, are very uncommon instances. I therefore conceive that 60 feet may be considered as the size of the largest animals of this species, and 65 feet in length as a magnitude which very rarely occurs.

Yet I believe that whales now occur of as large dimensions as at any former period, since the commencement of the whale fishery. This point I endeavoured to prove, from various historical records, in a paper read before the Wernerian Society, on the 19th day of December, 1818, and since inserted in the *Edinburgh Philosophical Journal*, No. 1. p. 83.

In this paper, I brought forward the authorities of Zorgdrager, the writer of an account of the whale fishery, and one of the early superintendants of the Dutch northern fisheries, together with opinions or remarks of Captain Anderson, Gray, Heley, and others, who were among the earliest of the English whalers, which satisfactorily prove, that the average and largest produce of a whale in oil, was not greater near two hundred years ago than it is at the present time; and to these are added the testimonies of Captain Jenkinson and Edge, as to the length of the whale, which likewise corresponds pretty nearly with the measurements I have myself made.

Jenkinson, in his voyage to Russia, performed in 1557, saw a number of whales, some of which, by estimation, were

60 feet long, and are described as being "very monstrous." Edge, who was one of the Russia Company's chief and earliest whale fishers, having been ten years to Spitzbergen, prior to the year 1625, calls the whale "a sea beast of hughe bigness, about 65 foot long, and 35 foot thick," having whale-bone ten or eleven feet long, (a common size at present,) and yielding about 100 hogsheads of oil; and in a descriptive plate, accompanying Capt. Edge's paper on the fishery, published by Purchas, in 1625, is a sketch of a whale, with this remark subjoined—"a whale is ordinarily about 60 foot long."

Hence, I conceive, we may satisfactorily conclude that whales of as large size, are found now, as at any former period since the Spitzbergen fishery was discovered; and I may also remark, that where any respectable authority affords actual measurement exceeding 70 feet, it will always be found that the specimen referred to was not one of mysticetus kind, but of *B. Physalis* or the *B. Musculus* animals, which considerably exceed in length any of the common whales that I have either heard of, or met with.

When fully grown, therefore, the length of the whale may be stated as varying from 50 to 65, and rarely, if ever, reaching 70 feet; and its greatest circumference from 30 to 40 feet. It is thickest a little behind the fins, or in the middle, between the anterior and posterior extremes of the animal; from whence it gradually tapers, in a conical form, towards the tail, and slightly towards the head. Its form is cylindrical from the neck to within ten feet of the tail, beyond which it becomes somewhat quadrangular, the greatest ridge being upwards, or on the back, and running backward nearly across the middle of the tail. The head has somewhat of a triangular shape. The under part, the arched outline of which is given by the jaw bones, is flat, and measures 16 to 20 feet in length, and 10 to 12 feet in breadth. The lips, extending 15 or 20 feet in length, and five or six in height, and forming the cavity of the mouth, are attached to the under jaw, and rise from the jaw-bones, at an angle of about 80 degrees, having the appearance, when viewed in front, of the letter U. The upper jaw, including the crown bone or skull, is bent down at the extremity, so as to shut the front and upper parts of the cavity of the mouth, and is overlapped by the lips in a squamous manner at the sides.

When the mouth is open, it presents a cavity as large as a room, and capable of containing a merchant ship's jolly boat, full of men, being six or eight feet wide, ten or twelve feet high (in front,) and fifteen or sixteen feet long.

The fins, two in number, are placed between one-third and two-fifths of the animal from the snout, and about two feet behind the angle of the mouth; they are from seven to nine feet in length, and four or five in breadth. The part by which they are attached to the body is somewhat elliptical, and about two feet in diameter; the side which strikes the water is nearly flat. The articulation being spherical, the fins are capable of motion in any direction; but, from the tension of the flesh and skin below, they cannot be raised above the horizontal position. Hence, the account given by some naturalists, that the whale supports its young by its fin on its back, must be erroneous. The fins after death are always hard and stiff; but in the living animal, it is presumed, from the nature of the internal structure, that they are capable of considerable flexion. The whale has no dorsal fin. The tail, comprising in a single surface 80 or 100 square feet, is a formidable instrument of motion and defence. Its length is only five or six feet; but its width is from 18 to 24 or 26 feet. Its position is horizontal. In its form it is flat and semilunar; indented in the middle; the two lobes somewhat pointed, and turned a little backward. Its motions are rapid and universal; its strength immense.

The eyes are situated in the sides of the head, about a foot, obliquely, above and behind the angle of the mouth. They are remarkably small, in proportion to the bulk of the animal's body, being little larger than those of an ox. The whale has no external ear; nor can any orifice for the admission of sound be discovered until the skin is removed.

On the most elevated part of the head, about sixteen feet from the anterior extremity of the jaw, are situated two blow-holes, or spiracles, consisting of two longitudinal apertures, six or eight inches in length. These are the proper nostrils of the whale; a moist vapour, mixed with mucus is discharged from them when the animal breathes; but no water accompanies it, unless an expiration of the breath be made under the surface.

The mouth, in place of teeth, contains two extensive rows of fins or whalebone, which are suspended from the sides of the crown bone. These series of fins are generally curved longitudinally, although they are sometimes straight, and give an arched form to the roof of the mouth. They are covered immediately by the lips attached to the lower jaw, and enclose the tongue between their lower extremities, each series, or "side of bone," as the whale fishers term it, consists of upward of 300 laminæ;* the longest are near the middle, from

* In a very small whale the number was 316 or 320.

whence they gradually diminish away to nothing at each extremity; fifteen feet is the greatest length of the whalebone; but ten or eleven feet is the average size, and thirteen feet is a magnitude seldom met with. The greatest breadth, which is at the gum, is ten or twelve inches. The laminae, composing the two series of bone, are ranged side by side two-thirds of an inch apart, (thickness of the blade included,) and resemble a frame of saws in a saw-mill; the interior edges are covered with a fringe of hair, and the exterior edges of every blade, excepting a few at each extremity of the series, is curved and flattened down, so as to present a smooth surface to the lips. In some whales a curious hollow on one side, and ridge on the other, occurs in many of the central blades of whalebone, at regular intervals of six or seven inches. May not this irregularity, like the rings in the horn of the ox, which they resemble, afford an intimation of the age of the whale? if so, twice the number of running feet in the longest lamina of whalebone, in the head of a whale not full grown, would represent its age in years. In the youngest whales, called suckers, the whalebone is only a few inches long; when the length reaches six feet or upwards, the whale is said to be *size*. The colour of the whalebone is brownish black, or bluish black. In some animals it is striped longitudinally with white. When newly cleaned, the surface exhibits a fine play of colour. A large whale sometimes affords a ton and half of whalebone. If the "sample blade," that is, the largest lamina in the series weigh seven pounds, the whole produce may be estimated at a ton; and so on in proportion. The whalebone is inserted into the crown bone, in a sort of rabbit. All the blades in the same series are connected together by the gum, in which the thick ends are inserted. This substance (the gums) is white, fibrous, tender, and tasteless; it cuts like cheese. It has the appearance of the interior or kernel of the cocoa nut. The tongue occupies a large portion of the cavity of the mouth: and the arch, formed by the whalebone, is capable of protrusion, being fixed from root to lip, to the fat extending between the jaw bones.

A slight beard, consisting of a few short scattered white hairs, surmounts the anterior extremity of both jaws.

The throat is remarkably straight.

Two paps in the females afford the means of rearing the young. They are situated on the abdomen, one on each side of the pudendum, and are two feet apart. They appear not to be capable of protrusion, beyond the length of a few inches. In the dead animal they are always found retracted.

The milk of a whale resembles that of a quadruped in its

appearance. It is said to be rich and well flavoured. The vent is about six inches behind the pudendum of the female; but in the male, it is further back.

The colour of the mysticetus is velvet black, gray, (composed of dots of blackish brown on a white ground,) and white with a tinge of yellow. The back, most of the upper jaw, and part of the lower jaw, together with the fins and tail, are black. The tongue, the lower part of the under jaw and lips, sometimes a little of the upper jaw, at the extremity, and a portion of the belly are white; and the eye-lids, the junction of the tail with the body, a portion in the axillæ of the fins, &c. are gray. I have seen whales that were all over piebald. The older animals contain the most gray and white; under size whales are altogether of a bluish black, and suckers of pale bluish or bluish gray colour.

The skin of the body is slightly furrowed like the water-lines on coarse laid paper. On the tail-fins, &c. it is smooth. The cuticle, or that part of the skin which can be pulled off in sheets, after it has been a little dried in the air, or particularly in frost, is not thicker than parchment. The rete mucosum in adults is about three-fourths of an inch in thickness over most parts of the body; in suckers nearly two inches; but on the under side of the fins, on the inside of the lips, and on the surface of the tongue, it is much thinner. This part of the integuments is generally of the same colour throughout its thickness. The fibres, of which it is composed, are perpendicular to the surface of the body; under this lies the true skin, which is white and tough. As it imperceptibly becomes impregnated with oil, and passes gradually into the form of blubber, its real thickness cannot easily be stated. The most compact part, perhaps, may be a quarter of an inch thick.

Immediately beneath the skin lies the blubber or fat, encompassing the whole body of the animal, together with the fins and tail. Its colour is yellowish white, yellow, or red. In the very young animals it is always yellowish white. In some old animals it resembles in colour the substance of the salmon. It swims in water. Its thickness all round the body is eight or ten or twenty inches, varying in different parts, as well as in different individuals. The lips are composed almost entirely of blubber, and yield from one to two tons of pure oil each. The tongue is chiefly composed of a soft kind of fat, that affords less oil than any other blubber; in the centre of the tongue, and towards the root, the fat is intermixed with fibres of a muscular substance. The under jaw, excepting the two jaw bones, consists almost wholly of fat, and the crown bone possesses a considerable coating of it; the fins are principally blubber,

tendons and bones, and the tail possesses a thin stratum of blubber. The oil appears to be retained in the blubber in minute cells, connected together by a strong reticulated combination of tendinous fibres. These fibres being condensed at the surface, appear to form the substance of the skin. The oil is expelled when heated, and in a great measure discharges itself out of the *henks*, whenever putrefaction in the fibrous parts of the blubber takes place. The blubber and the whalebone are the parts of the whale to which the attention of the fisher is directed. The flesh and bones, excepting occasionally the jaw-bone, are rejected. The blubber, in its fresh state, is without any unpleasant smell, and it is not until after the termination of the voyage, when the cargo is unstowed, that a Greenland ship becomes disagreeable.

Four tons of blubber, by measure, generally affords three tons of oil,* but the blubber of a sucker contains a very small portion. Whales have been caught that afforded nearly thirty tons of pure oil, and whales yielding twenty tons of oil are by no means numerous. The quantity of oil yielded by a whale generally bears a certain proportion to the length of its longest blade of whalebone.

The average quantity is expressed in the following table.†

Length of whalebone in feet.	1	2	3	4	5	6	7	8	9	10	11	12
Oil yielded in tons.	1½	2½	2¾	3½	4	5	6½	8½	11	13½	17	21

Though this statement, on the average, be exceedingly near the truth, yet exceptions sometimes occur. A whale of 2½ feet bone, for instance, has been known to produce near ten tons of oil, and another of twelve feet bone only nine tons. Such instances, however, are very uncommon.

A stout whale of sixty feet in length is of the enormous weight of seventy tons; the blubber weighs about thirty tons, the bones of the head, whalebone, fins and tail eight or ten; carcass thirty or thirty-two.

* The ton or tun of oil is 252 gallons, wine measure; it weighs, at temperature 60°, 1933 lbs. 12 oz. 14 dr. avoirdupoise.

† This table is somewhat different from that given in *Wernerian Memoirs*, (vol. i. p. 582,) an increased number of observations having enabled me to improve it.

The flesh of the young whale is of a red colour; and when cleared of fat, broiled and seasoned with pepper and salt, does not eat unlike coarse beef; that of the old whale approaches to black, and is exceedingly coarse. An immense bed of muscles, surrounding the body, is appropriated chiefly to the movements of the tail. The tail consists principally of two reticulated beds of sinewy fibres, compactly interwoven, and containing very little oil. In the central bed, the fibres run in all directions; in the other, which encompasses the central one in a thinner stratum, they are arranged in regular order. These substances are extensively used, particularly in Holland, in the manufacture of glue.

Most of the bones of the whale are very porous, and contain large quantities of fine oil. The jaw bones, which measure twenty to twenty-five feet in length, are often taken care of, principally on account of the oil which drains out of them when they come into a warm climate. When exhausted of oil, they readily swim in water. The external surface of the most porous bones is compact and hard; the ribs are pretty nearly solid; but the crown bone is almost as much honey-combed as the jaw bones. The number of ribs, according to Sir Charles Giesecke, is thirteen on each side. The bones of the fins are analogous, both in proportion and number, to those of the fingers of the human hand. From this peculiarity of structure, the fins have been denominated by Dr. Fleming "swimming paws." The posterior extremity of the whale, however, is a real tail, the termination of the spine, or os coccygis, running through the middle of it, almost to the edge.

As the whale is flensed while afloat, with nearly the whole of the carcass under water, few opportunities of examining its anatomical structure occur. The smallest animals of this species, mere cubs, or "suckers," may indeed be hoisted on deck; and it is in such cases only that I have had a chance of inspecting them entirely out of the water. One of these having been taken, the head was hoisted aboard in a mass, and the body, when stripped of the fat, was so small as to be quite within the power of the tackles. Some new facts, respecting the anatomy of the whale, arose out of the investigation of this and another of the species, killed in the summer of 1821, which I shall attempt to describe. The following measurements and weight, it must be observed, all refer to a sucking whale, that at the time of capture was under maternal protection, but the other details in general may be considered as applying to the whole species of the *Balæna Mysticetus*.

This whale, though a "sucker," was nineteen feet in length, and fourteen feet five inches in circumference, at the thickest

part of the body. The external skin consisting of cuticle and rete mucosum, was on the body an inch and three-quarters thick, being about twice the thickness of the same membranes in a full grown animal. The blubber, on an average, was five inches in thickness. The largest of the whalebone measured only twelve inches; about one half of which was imbedded in the gum. The external part of these fringes, not exceeding six inches in length, did not seem sufficient to enable the little whale yet to catch, by filtration out of the sea, the shrimps and other insects on which the animal, in a more advanced stage, is dependant for its nourishment: maternal assistance and protection, therefore, appeared to have been essential for its support. The muscles about the neck, appropriated to the movements of the jaws, formed a bed, if extended, of nearly five feet broad, and a foot thick. The central part of the diaphragm was two inches in thickness. The two principal arteries in the neck (the carotid) were so large as to admit a man's hand and arm.

The brain lies in a small cavity in the upper and back part of the skull. The cavity included within the *pia mater*, exclusive of the foramen magnum, measured only eight inches by five. The upper part of the brain lies very near the surface of the skull. The convolutions of the cortical substance lie in beautiful fringed folds, attached to the medullary portion, which is white, as in the human brain. The general appearance of the brain is not unlike that of the other mammalia, but its smallness is remarkable. The quantity of brain in a human subject of 140 or 160 pounds weight is, according to Haller, 4 pounds; in this whale, of 11,200 pounds, or seventy times the weight of a man, the brain was only 3 pounds-12 ounces. According to Cuvier the brain in man varies from one thirty-first to one twenty-second part of his weight;* whereas, in this animal, the proportion of brain was only a three thousandth part.

The heart, which is of an oblong form, much compressed, resembles in colour and substance the heart of an ox. The breadth of it, in this specimen, was 29 inches, the height 12, the thickness 9, and the weight of it 64 lbs. Diameter of the aorta about six inches.

Large as the whale is in bulk, the throat is but narrow. In

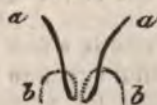
* Leçons d'Anat. Comp. ii. 149. The proportion the human brain bears to the weight of the body, appears to be, on an average, less than is stated by Cuvier. According to Haller, the proportion in a man of 160 lbs. weight is one fortieth; in a man of 140 lbs., one thirty-fifth, in a child six years old, one twenty-second.

this animal the diameter of the œsophagus, when fully distended, was scarcely $2\frac{1}{2}$ inches, with difficulty admitting my hand.

The epiglottis is a beautiful valve, formed almost like the termination of the proboscis of an elephant. Though the larynx in the whale has a free communication with the mouth, as in quadrupeds, yet the mysticetus does not appear to have any voice. In other cetacea, however, this is not always the case; some of the dolphins, in particular, having been heard to emit a shrill sound, which in the beluga may be heard before the animal arises to the surface of the water.*

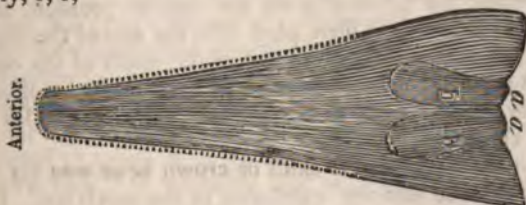
The external blowholes or spiracles were, in the sucking whale, four inches in length; in the full grown animal they form two curved slits, above ten inches long. In passing downward through the blubber, the blowholes, which at the surface are nearly longitudinal, as in the annexed figure, *a, a*, twist in-

Posterior.



Anterior.

to a semicircular and transverse position, in the form of the dotted line *b, b*, then penetrating the skull, they proceed backward and downward in two conical parallel canals, until they open near the back of the under part of the skull, where they inosculate and form a single membranous sac, within a few inches of the epiglottis. The first impression of each blowhole on the upper part of the skull, is marked as in the following cut, (representing the upper surface of the anterior part of the whale's skull, the skin and fat being removed,) by an oblong cavity, *b, b*,



which is the seat of a muscular substance attached by its anterior extremity to the surface of the skull, and also attached,

* Captain Parry's Voyage for the discovery of a North West passage, p. 35.

by its posterior and inferior extremity, to the interior of the skull, at some depth in the blowing canal, *a, a*. The part of this muscle that penetrates the bony canal is of a conical form, the apex downward, or within, represented at *b*, in the annexed figure of a vertical section of the skull;



Anterior portion.

so that when this interior portion contracts, the muscular cone *b*, is drawn tight into the orifice, and completely closes the breathing canal *a, a*; while on the other hand, the action of the external part of the muscles draws the conical plug forward and upward, and affords a free passage for the air in respiration. This beautiful structure it is, (aided perhaps by the epiglottis,) that enables the animal, under the immense pressure to which it is sometimes exposed, to exclude the sea-water from its lungs. This pressure, under some depths to which the whale is known to descend, is upwards of a ton upon every square inch; yet, so far from the water being forced down the spiracles, the enormous load serves only more effectually to press down and close the valves that defend the passages to the lungs.

The whale has no external ear, and the opening of the passage to this organ is so small as not to be easily discovered. In the sucking whale, it was only one-sixth of an inch in diameter. An elegant contrivance appears in the meatus auditorius externus for protecting the ear against pressure from without. It consists of a little plug, like the end of the finger, inserted into a corresponding cavity, in the midst of the canal, by a slight motion of which the opening can either be effectually shut for the exclusion of the sea-water, or opened for the admission of sound.

In the sucking whale, the skull or crown bone was six feet in length, from the anterior extremity to the condyles. In a full grown animal, in which the whalebone was ten feet four inches, the length of the skull, measured along the upper and convex side of the curve, was twenty feet eight inches, the cavity on the crown of the same, occupied by the muscular valve of the blowholes, was 14 inches wide, and 24 inches long.

The whale being very nearly of the same specific gravity as sea-water, (some few individuals sinking, and others barely floating when dead,) the weight may be calculated with considerable precision. The body of the whale may be divided into three segments, forming tolerably regular geometric solids. First; the *head* a parabolic conoid, which in the sucking whale is four feet in diameter, and five and a half feet in height; its solid contents about thirty-four and a half cubic feet. Secondly; the middle segment, extending from the head to the thickest part of the body: this is a frustum of a cone in the sucking whale, three feet in length, and four to five feet in diameter, producing a solid content of forty-eight cubic feet. Thirdly; the posterior segment, extending from the greatest circumference to the tail: this segment is a paraboloid or parabolic conoid, with its smaller end truncated. Its length in the sucking whale is eight feet; its diameters one and five feet; and its solid contents eighty-one and a half cubic feet. And to these products may be added about ten cubic feet, the estimated bulk of the fins and tail, which make an amount of 147 cubic feet: this sum, divided by 35, the number of cubic feet of sea-water in the Greenland ocean, in a ton weight, gives the weight of the animal five tons within a cubic foot.

One of the largest mysticete, of sixty feet in length, the head twenty feet in length, by twelve feet in diameter, the middle-section six feet by thirteen diameter, the third section twenty-six feet in length, by twelve and two feet diameter, will appear (if calculated the same way with an allowance of five tons for the fins and tail) to be of the prodigious weight of 114 tons! But as the last section is somewhat more slender than the body to which it is referred, this calculation may be a little in excess.

The largest animals of this species may, however, I conceive, be safely stated at a hundred tons in weight; and an ordinary full grown animal at seventy tons.

The most useful and ennobling view of natural history is, unquestionably, that which gives us the most exalted conceptions of the wisdom, power, and goodness of the Creator. And the branch of this science, that is in the highest degree calculated to assist us in tracing "the works of Nature up to Nature's God," is probably the physiology of animals. In every genus of animals we discover peculiar marks of adaptation for their economy or mode of life, and an endless variety of inimitable contrivances for accomplishing this adaptation.

The whale, which is a mammiferous animal, and closely allied, in its anatomical structure, to the class of quadrupeds, affords in the modification of the parts and principles of land

animals, for applying them to a tribe inhabiting the sea, a great number of those striking displays of wisdom and power, the very contemplation of which is calculated to elevate, in no inconsiderable degree, our conceptions of the Great Supreme. The mysticetus feeds on the smallest insects; its capacious mouth, with the vast fringes of whalebone, which is a most admirable filter, enables it to receive some tons of water at a mouthful, and to separate every substance from it, of the size of a pin's head and upwards. The *Physalis* feeds on herrings, mackerel and other fishes of a similar kind; its whalebone therefore is shorter, stronger, and less compact than that of the mysticetus, and the filter formed by it less perfect.

As the whale must rise to the surface of the sea to breathe, its tail is placed horizontally, to enable it to ascend and descend more quickly; and its nostrils, or blowholes, instead of being placed at the snout, are generally on the most elevated part of the head, that they may be readily lifted clear of the water.

When the whale descends to the depths of the ocean, it becomes exposed to an enormous pressure from the superincumbent water. This pressure is sufficient to force the water through the pores of the hardest wood; yet it is effectually resisted by the skin of the whale, though it is remarkably soft and flexible. To exclude the water from the lungs, which would occasion suffocation if admitted, the blowholes are defended by the peculiar valves that have been already described.

The variety discovered in the structure of whales, is by no means one of the least interesting parts of their physiology. In other classes of animals, whose habits are similar, we often find that each organ is the same as the corresponding one, in almost all the species of the same genus, or even of the same order; excepting when their peculiar habits, or necessities, require a modification of the general structure or principle. But in whales, as if it were intended not only to exhibit the matchless wisdom of the Creator, but to show that his resources are unlimited, the structure of the breathing canals is varied in the different genera of cetaceous animals, and a number of contrivances, alike extraordinary, equally beautiful, and equally efficient, are adapted for performing the same office.

TABLE of the comparative dimensions of six *Mysticete*, from
my own measurements.

	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.
Longest blade of whalebone, . . .	1 0	6 0	10 10	11 2	11 6	13 7	
Extreme length, . . .	17 0	28 0	51 0	50 0	58 0	52 0	
Length of the head, . . .	5 0	8 6	16 0	15 6	19 0	20 0	
Breadth of under jaw, . . .				9 6	12 0		
Length from tip of lip to fin, . . .	5 6	10 0		18 0			
— to greatest circumference, . . .	7 0			24 0			
Circumference at the neck, . . .	10 0	18 6		31 6		34 0	
Greatest circumference, . . .	12 0	20 0		34 0	35 0		
Circumference by the genitalia, . . .	9 0	15 6		19 0			
— near the tail, . . .	2 11	4 0	6 6	6 8			
Fin length, . . .	2 3		7 0	6 4	8 6	9 0	
— breadth, . . .	1 3		4 0	4 0	5 0		
Tail length, . . .			5 6	5 6	6 0	6 0	
— breadth, . . .			20 0	17 6	24 0	20 10	
Lip length, . . .	4 9	8 2	15 6	15 0	18 6	19 6	
— breadth, . . .						6 2	
Produce in oil (tons) . . .	1	4	16	16	19	24	
Sex, . . .	F.	M.		F.		M.	

The whale seems dull of hearing. A noise in the air, such as that produced by a person shouting, is not noticed by it, though at the distance only of a ship's length : but a very slight splashing in the water in calm weather excites its attention, and alarms it.

Its sense of seeing is acute ; whales are observed to discover one another in clear water, when under the surface, at an amazing distance. When at the surface, however, they do not see far.

They have no voice ; but in breathing or blowing they make a very loud noise. The vapour they discharge is ejected to the height of some yards, and appears at a distance like a puff of smoke. When the animals are wounded, it is often stained with blood ; and, on the approach of death, jets of blood are sometimes discharged alone. They blow strongest, densest, and loudest, when "running." When in a state of alarm, or when they first appear at the surface, after being a long time down, they respire or blow about four or five times a minute.

The whale being somewhat lighter than the medium in which it swims, can remain at the surface of the sea, with its "crown," in which the blowholes are situated, and a considerable extent of the back, above water, without any effort or motion. To descend, however, requires an exertion. The proportion of the whale that appears above water, when alive, or when recently killed, is probably not a twentieth part of the animal; but within a day after death, when the process of putrefaction commences, the whale swells to an enormous size, until at least a third of the carcass appears above water, and sometimes the body is burst by the force of air generated within.

By means of the tail principally, the whale advances through the water. The greatest velocity is produced by powerful strokes against the water, impressed alternately upward and downward; but a slower motion, it is believed, is elegantly produced, by cutting the water laterally, and obliquely, downward, in a manner similar to that in which a boat is forced along, with a single oar, by the operation of skulling. The fins are generally stretched out in an horizontal position: their chief application seems to be the balancing of the animal, as the moment life is extinct, it always falls over on its side, or turns upon its back. They appear also to be used in bearing off their young, in turning, and giving a direction to the velocity produced by the tail.

Bulky as the whale is, and inactive, or indeed clumsy as it appears to be, one might imagine that all its motions would be sluggish, and its greatest exertions productive of but little celerity. The fact, however, is the reverse. A whale extended motionless at the surface of the sea, can sink in the space of five or six seconds, or less, beyond the reach of its human enemies. Its velocity along the surface, or perpendicularly, or obliquely downward, is the same. I have observed a whale descending after I had harpooned it, to the depth of 400 fathoms, with the average velocity of seven or eight miles per hour. The usual rate at which whales swim, however, even when they are on their passage from one situation to another, seldom exceeds four miles an hour; and though, when urged by the sight of an enemy, or alarmed by the stroke of a harpoon, their extreme velocity may be at the rate of eight or nine miles an hour, yet we find this speed never continues longer than for a few minutes, before it relaxes to almost one half; hence, for the space of a few minutes, they are capable of darting through the water with the velocity almost of the fastest ship under sail, and of ascending with such rapidity as to leap entirely out of the water. This feat they sometimes perform as an amusement

apparently, to the high admiration of the distant spectators ; but to the no small terror of the inexperienced fishers, who, even under such circumstances, are often ordered by the fool-hardy harpooner to "pull away" to the attack. Sometimes the whales throw themselves into a perpendicular posture, with their heads downwards, and rearing their tails on high in the air, beat the water with awful violence. In both these cases the sea is thrown into foam, and the air filled with vapours : the noise in calm weather is heard to a great distance ; and the concentric waves, produced by the concussions on the water, are communicated abroad to a considerable extent. Sometimes the whale shakes its tremendous tail in the air, which, cracking like a whip, resounds to the distance of two or three miles.

When it retires from the surface, it first lifts its head, then plunging it under water, elevates its back, like the segment of a sphere, deliberately rounds it away towards the extremity, throws its tail out of the water, and then disappears.

In their usual conduct, whales remain at the surface to breathe, about two minutes, seldom longer ; during which time they "blow" eight or nine times, and then descend for an interval usually of five or ten minutes, but sometimes, when feeding, fifteen or twenty. The depth to which they commonly descend is not known, though, from the eddy occasionally observed on the water, it is evidently at times only trifling. But when struck, the quantity of line they sometimes take out of the boats, in a perpendicular descent, affords a good measure of the depth. By this rule they have been known to descend to the depth of an English mile, and with such velocity, that instances have occurred, in which whales have been drawn up by the line attached, from the depth of 700 or 800 fathoms, and have been found to have broken their jaw-bones, and sometimes crown bone, by the blow struck against the bottom. Some persons are of opinion that whales can remain under a field of ice, or at the bottom of the sea in shallow water, when undisturbed, for many hours at a time. Whales are seldom found sleeping, yet in calm weather, among ice, instances occasionally occur.

The food of the whale consists of various species of actiniae, cliones, sepiae, medusæ, caneri, and helices, or, at least, some of these genera are always to be seen, wherever any tribe of whales is found stationary and feeding. In the dead animals, however, in the very few instances in which I have been enabled to open their stomachs, squillæ or shrimps were the only substances discovered. In the mouth of a whale just killed, I once found a quantity of the same kind of insect.

When the whale feeds, it swims with considerable velocity below the surface of the sea, with its jaws widely extended. A stream of water consequently enters its capacious mouth, and along with it large quantities of water insects; the water escapes again at the sides; but the food is entangled and sifted, as it were, by the whalebone, which, from its compact arrangement, and the thick internal covering of hair, does not allow a particle the size of the smallest grain to escape.

There does not seem to be sufficient dissimilarity in the form and appearance of the mysticete found in the polar seas, to entitle them to a division into other species; yet such is the difference observed in the proportions of these animals, that they may be well considered as sub-species or varieties. In some of the mysticete, the head measures four-tenths of the whole length of the animal; in others, scarcely three-tenths; in some the circumference is upwards of seven-tenths of the length, in others less than six-tenths, or little more than one half.

The sexual intercourse of whales is often observed about the latter end of summer; and females, with cubs or suckers along with them, being most commonly met with in the spring of the year, the time of their bringing forth, it is presumed, is in February or March, and their period of gestation about nine or ten months. In the latter end of April 1811, a sucker was taken by a Hull whaler, to which the funis umbilicalis was still attached. The whale has one young at a birth. Instances of two being seen with a female are very rare. The young one, at the time of parturition, is said to be at least ten if not fourteen feet in length. It goes under the protection of its mother for probably a year or more, or until, by the evolution of the whalebone, it is enabled to procure its own nourishment. Supposing the criterion before mentioned, of the notches in the whalebone being indicative of the number of years growth to be correct, then it would appear that the whale reaches the magnitude called *size*, that is, with a six feet length of whalebone, in twelve years, and attains its full growth at the age of twenty or twenty-five. Whales, doubtless, live to a great age. The marks of age are, increase in the quantity of gray colour in the skin, and a change to a yellowish tinge of the white parts about the head; a decrease in the quantity of oil yielded by a certain weight of blubber; an increase of hardness in the blubber, and in the thickness and strength of the ligamentous fibres of which it is partly composed.

The maternal affection of the whale, which, in other respects, is apparently a stupid animal, is striking and interesting; the cub, being insensible to danger, is easily harpooned; when

the tender attachment of the mother is so manifested, as not unfrequently to bring her within the reach of the whalers. Hence, though a cub is of little value, seldom producing above a ton of oil, and often less, yet it is sometimes struck as a snare for its mother. In this case she joins it at the surface of the water, whenever it has occasion to rise for respiration; encourages it to swim off; assists its flight by taking it under her fin, and seldom deserts it while life remains. She is then dangerous to approach; but affords frequent opportunities for attack. She loses all regard for her own safety in anxiety for the preservation of her young; dashes through the midst of her enemies; despises the danger that threatens her; and even voluntarily remains with her offspring, after various attacks on herself from the harpoons of the fishers. In June 1811, one of my harpooners struck a sucker, with the hope of its leading to the capture of the mother. Presently she arose close by the "fast boat," and seizing the young one, dragged about a hundred fathoms of line with remarkable force and velocity. Again she arose to the surface, darted furiously to and fro, frequently stopped short, or suddenly changed her direction, and gave every possible intimation of extreme agony. For a length of time she continued thus to act, though closely pursued by the boats; and, inspired with courage and resolution by the concern for her offspring, seemed regardless of the danger which surrounded her. At length one of the boats approached so near that a harpoon was hove at her. It hit, but did not attach itself. A second harpoon was struck; this also failed to penetrate; but a third was more effectual, and held. Still she did not attempt to escape; but allowed other boats to approach; so that, in a few minutes, three more harpoons were fastened, and in the course of an hour afterward she was killed.

There is something extremely painful in the destruction of a whale, when thus evincing a degree of affectionate regard for its offspring, that would do honour to the superior intelligence of human beings; yet the object of the adventure, the value of the prize, the joy of the capture, cannot be sacrificed to feelings of compassion. Whales, though often found in great numbers together, can scarcely be said to be gregarious; found most generally solitary, or in pairs, excepting when drawn to the same spot by the attraction of an abundance of palatable food, or a choice situation of the ice.

The superiority of the sexes, in point of numbers, seems to be in favour of the male. Of 124 whales which have been taken near Spitzbergen, in eight years, in ships commanded by myself, 70 were males, and 54 were females, being in the

proportion of five to four nearly. The mysticetus occurs most abundantly in the frozen seas of Greenland and Davis's Strait—in the bays of Baffin and Hudson—in the sea to the northward of Behring's Strait, and along some parts of the northern shores of Asia, and probably America. It is never met with in the German Ocean, and rarely within 200 leagues of the British coast; but along the coasts of Africa and South America it is met with periodically in considerable numbers. In these regions it is attacked and captured by the Southern British and American Whalers, as well as by some of the people inhabiting the coasts, to the neighbourhood of which it resorts. Whether this whale is precisely of the same kind as that of Spitzbergen and Greenland, is uncertain, though it is evidently a mysticetus. One striking difference, possibly the effect of situation and climate, is, that the mysticetus found in southern regions is often covered with barnacles, (*Lepas diadema*, &c.) while those of the Arctic seas are free from these shell fish.

It would be remarkable if an animal like the whale, which is so timid that a bird alighting upon its back sometimes sets it off in great agitation and terror, should be wholly devoid of enemies. Besides man, who is doubtless its most formidable adversary, it is subject to annoyance from sharks, and it is also said from the narwal, sword-fish, and thresher. With regard to the narwal, I am persuaded that this opinion is incorrect, for so far from its being an enemy, it is found to associate with the whale in the greatest apparent harmony, and its appearance, indeed, in the Greenland sea is hailed by the fishers, the narwal being considered as the harbinger of the whale. But the sword-fish and thresher (if such an animal there be) may possibly be among the enemies of the whale, notwithstanding I have never witnessed their combats; and the shark is known certainly to be an enemy, though perhaps not a very formidable one. Whales indeed flee the seas where it abounds, and evince by marks occasionally found on their tails, a strong evidence of their having been bit by the shark. A living whale may be annoyed, though it can scarcely be supposed to be ever overcome by the shark; but a dead whale is an easy prey, and affords a fine banquet to this insatiable creature.

The whale, from its vast bulk, and variety of products, is of great importance in commerce, as well as in the domestic economy of savage nations; and its oil and whalebone are of extensive application in the arts and manufactures. A description of its most valuable products, and of the uses to which they are applied, being included in the account of the whale fishery, which follows, it will only be necessary in this

place to mention the purposes to which parts and products, not now objects of commerce, are or might be applied.

Though to the refined palate of a modern European, the flesh of a whale, as an article of food, would be received with abhorrence, yet we find that it is considered by some of the inhabitants of the northern shores of Europe, Asia, and America, as well as those on the coasts of Hudson's Bay, and Davis's Strait, as a choice and staple article of subsistence. The Esquimaux eat the flesh and fat of the whale, and drink the oil with greediness. Indeed, some tribes, who are not familiarized with spirituous liquors, carry along with them in their canoes, in their fishing excursions, bladders filled with oil, which they use in the same way, and with a similar relish, that a British sailor does a dram.* They also eat the skin of the whale raw, both adults and children; for it is not uncommon, when the females visit the whale-ships, for them to help themselves to pieces of skin, preferring those with which a little blubber is connected, and to give it as food to their infants suspended on their backs, who suck it with apparent delight.

Blubber, when pickled and boiled, is said to be very palatable; the tail, when parboiled, and then fried, is said to be not unsavoury, but even agreeable eating; and the flesh of young whales, I know from experiment, is by no means indifferent food.

Not only is it certain that the flesh of the whale is now eaten by savage nations, but it is also well authenticated that, in the 12th, 13th, 14th, and 15th centuries, it was used as food by the Icelanders, the Netherlands, the French, the Spanish, and probably by the English. M. S. B. Noel, in a tract on the whale fishery,† informs us that about the 13th century the flesh, particularly the tongue of the whales, was sold in the markets of Bayonne, Cibourre and Beariz, where it was esteemed as a great delicacy, being used at the best tables; and even so late as the 15th century, he conceives, from the authority of Charles Etienne, that the principal nourishment of the poor in Lent, in some districts of France, consisted of the flesh and fat of the whale.

Besides forming a choice eatable, the inferior products of the whale are applied to other purposes by the Indian and Esquimaux of Arctic countries, and with some nations are

* Ellis's Voyage to Hudson's Bay, p. 233.

† Memoire sur "l'Antiquité de la Pêche de la Baleine par les nations Europeennes."

essential to their comfort ; some membranes of the abdomen are used for an upper article of clothing, and the peritoneum, in particular, being thin and transparent, is used instead of glass in the windows of their huts ; the bones are converted into harpoons and spears, for striking the seal, or darting at the sea-birds, and are also employed in the erection of their tents, and with some tribes, in the formation of their boats ; the sinews are divided into filaments, and used as thread, with which they join the seams of their coats and tent cloths, and sew with great taste and nicety the different articles of dress they manufacture ; and the whalebone and other superior products, so valuable in European markets, have also their uses among them.

I shall conclude this account of the mysticetus with a sketch of some of the characters which belong generally to cetaceous animals.

Whales are viviparous ; they have but one young at a time, and suckle it with teats. They are furnished with lungs, and are under the necessity of approaching the surface of the water at intervals to respire in the air. The heart has two ventricles and two auricles. The blood is warmer than in the human species ; in a narwal that had been an hour and a half dead, the temperature of the blood was 97° ; and in a mysticetus recently killed 102° . All of them inhabit the sea.—Some of them procure their food by means of a kind of sieve, composed of two fringes of whalebone ; these have no teeth. Others have no whalebone, but are furnished with teeth. They all have two lateral or pectoral fins, with concealed bones like those of a hand ; and a large flexible horizontal tail, which is the principal member of motion. Some have a kind of dorsal fin, which is an adipose or cartilaginous substance, without motion. This fin, varying in form, size, and position, in different species, and being in a conspicuous situation, is well adapted for a specific distinction. The appearance and dimensions of the whalebone and teeth, especially the former, are other specific characteristics. All whales have spiracles or blowholes, some with one, others with two openings, through which they breathe ; some have a smooth skin all over the body ; others have rugæ or sulci about the region of the thorax and on the lower jaw. And all afford beneath the integuments, a quantity of fat or blubber, from whence a useful and valuable oil, the train oil of commerce, is extracted.

SPECIES II.—*The Razor-back.**Balæna Physalis*; L.*Balanoptera Gibbar*: LA CÉPÈDE.

This is the longest animal of the whale tribe, and, probably, the most powerful and bulky of created beings. It differs from the mysticetus in its form being less cylindrical, and its body longer and more slender; in its whalebone being shorter; its produce in blubber and oil being less; in its colour being of a bluer tinge; in its fins being more in number; in its breathing or blowing being more violent; in its speed being greater; in its actions being quicker and more restless, and in its conduct being bolder.

The length of the physalis is about 100 feet; its greatest circumference 30 or 35. The body is not cylindrical, but is considerably compressed on the side, and angular at the back. A transverse section near the fins is an oblong, and at the rump a rhombus. The longest lamina of whalebone measures about four feet; it affords ten or twelve tons of blubber. Its colour is a pale bluish black, or dark bluish gray, in which it resembles the sucking mysticetus. Besides the two pectoral fins, it has a small horny protuberance, or rayless and immovable fin, on the extremity of the back. Its blowing is very violent, and may be heard in calm weather at the distance of about a mile. It swims with a velocity at the greatest of about twelve miles an hour. It is by no means a timid animal, yet it does not appear to be revengeful or mischievous. When closely pursued by boats, it manifests little fear, and does not attempt to outstrip them in the race, but merely endeavours to avoid them by diving or changing its direction. If harpooned, or otherwise wounded, it then exerts all its energies, and escapes with its utmost velocity, but shows little disposition to retaliate on its enemies, or to repel their attacks by engaging in a combat. Though at a distance the physalis is sometimes mistaken by the whalers for the mysticetus, yet its appearance and actions are so different, that it may be generally distinguished. It seldom lies quietly on the surface of the water when blowing, but usually has a velocity of four or five miles an hour; and when it descends, it very rarely throws its tail in the air, which is a very general practice with the mysticetus.

The great speed and activity of the physalis render it a difficult and dangerous object of attack; while the small quantity of inferior oil it affords, makes it unworthy the general attention of the fishers. When struck, it frequently drags the fast

boat with such speed through the water, that it is liable to be carried immediately beyond the reach of assistance, and soon out of sight of both boats and ship. Hence the striker is under the necessity of cutting the line, and sacrificing his employer's property, for securing the safety of himself and companions. I have made different attempts to capture one of these formidable creatures. In the year 1818, I ordered a general chase of them, providing against the danger of having my crew separated from the ship, by appointing a rendezvous on the shore, not far distant, and preparing against the loss of much line, by dividing it at 200 fathoms from the harpoon, and affixing a buoy to the end of it. Thus arranged, one of these whales was shot, and another struck. The former dived with such impetuosity, that the line was broken by the resistance of the buoy, as soon as it was thrown into the water, and the latter was liberated within a minute by the division of the line, occasioned, it was supposed, by its friction against the dorsal fin. Both of them escaped. Another physalis was struck by one of my inexperienced harpooners, who mistook it for a mysticetus. It dived obliquely with such velocity, that 480 fathoms of line were withdrawn from the boat in about a minute of time. This whale was also lost by the breaking of the line.

The following observations on this animal have been derived from different persons who have had opportunities of examining it when dead.

Length of a physalis found dead in Davis's Strait 105 feet, greatest circumference about 38. Head small, compared with that of the common whale: fins long and narrow; tail about twelve feet broad, finely formed; whalebone about four feet in length, thick, bristly and narrow; blubber six or eight inches thick, of indifferent quality; colour bluish black on the back, and bluish gray on the belly; skin smooth, excepting about the side of the thorax, where longitudinal rugæ or sulci occur. The physalis occurs in great numbers in the Arctic seas, especially along the edge of the ice, between Cherie Island and Nova Zembla, and also near Jan Mayen. Persons trading to Archangel have often mistaken it for the common whale. It is seldom seen among much ice, and seems to be avoided by the mysticetus; as such, the whale fishers view its appearance with painful concern. It inhabits most generally, in the Spitzbergen quarter, the parallels of from 70 to 76 degrees, but in the months of June, July and August, when the sea is usually open, it advances along the land to the northward as high as the 80th degree of latitude. In open seasons it is seen near the headland at an earlier period. A whale, probably of this kind, 101 feet in length, was stranded on the banks of the Humber, about the middle of September 1750.

SPECIES III.—*The Broad-nosed Whale.**Balæna Musculus*; L.*Balænoptera Rorqual*: LA CEPEDE.

This species of whale frequents the coasts of Scotland, Ireland, and Norway, &c. and is said to feed principally upon herrings. Several characters of the musculus very much resemble those of the physalis, though I believe there is an essential difference between the two animals; the musculus being shorter, having a larger head and mouth, and rounder under jaw, than the physalis. Several individuals, apparently of this kind, have been stranded or killed on different parts of the coast of the United Kingdoms. One, 52 feet in length, was stranded near Eyemouth, June 19th, 1752. Another, nearly 70 feet in length, ran ashore on the coast of Cornwall, on the 18th of June 1797. Three were killed on the north-west coast of Ireland, in the year 1762, and two in 1763; one or two have been killed in the Thames, and one was embayed and killed in Baltic sound, Shetland, in the winter of 1817-18, some remains of which I saw. This latter whale was 82 feet in length, the jaw bones were 31 feet long, the longest lamina of whalebone about three feet long. Instead of hair at the inner edge and at the front of each blade of whalebone, it had a fringe of bristly fibres; and it was stiffer, harder, and more horny in its texture than common whalebone. This whale produced only about five tons of oil, all of it of an inferior quality, some of it viscid and bad. It was valued altogether, expenses of removing the produce and extracting the oil deducted, at no more than 60*l.* sterling. It had the usual sulci about the thorax, and a dorsal fin.

In its blowing, swimming, and general action, as well as in its appearance in the water, the musculus very much resembles the physalis, from which, indeed, while living, it can scarcely be distinguished.

SPECIES IV.—*The Finner.**Balæna Boops*; L.*Balænoptera Jubartes*: LA CEPEDE.

Length about 46 feet; greatest circumference of the body about 20 feet; dorsal protuberance or fin about two feet and a half high; pectoral fin four or five feet long, externally, and scarcely a foot broad; tail about three feet deep, and ten

broad; whalebone about 300 laminae on each side, the longest about 18 inches in length; the under jaw about 15 feet long, or one third of the whole length of the animal; sulci about two dozen in number; two external blowholes; blubber on the body two or three inches thick; under the sulci none.

In the Memoirs of the Wernerian Society, a description of a whale, corresponding in its dimensions, at least, with the *Balæna Boops*, has been given to the public by Mr. P. Neill, Edinburgh.* This whale was stranded on the banks of the Forth, near Alloa, and had been considerably mutilated before Mr. Neill had an opportunity of examining it. It is considered by him a *Balæna Rostrata*. From his valuable paper, part of the above description is taken, which differs so much from a *Rostrata* noticed below, particularly in its larger dimensions, and in the greater proportion which the head bears to the body, that it would appear to belong either to the *Balæna Boops* or to an undescribed species. From the inaccuracy of the sketches of almost all the whales hitherto figured, the naturalist is rather plagued than assisted by them. As such, the figures given by La Cèpede and others can scarcely be of any service in determining the species of this whale.

SPECIES V.—*The Beaked Whale*,

Balæna Rostrata; L.

Balenoptera Acuto Rostrata: LA CÈPEDE.

This is the last and the smallest of the whalebone whales with which I am acquainted. An animal of this species was killed in Scalpa Bay, November 14, 1808. Its length was $17\frac{1}{2}$ feet, circumference 20 feet, length from the snout to the dorsal fin $17\frac{1}{2}$ feet, from the snout to the pectoral fin 5 feet, from the snout to the eye $3\frac{1}{2}$ feet, and from the snout to the blowholes 3 feet. Pectoral fins two feet long and seven inches broad; dorsal fin 15 inches long by 9 inches high, tail 15 inches long by $4\frac{1}{2}$ feet broad. Largest whalebone about six inches. Colour of the back black; of the belly glossy white; and of the grooves of the plicæ, according to Mrs. Traill, who saw it on the beach in Scalpa Bay, a sort of flesh colour.

The *Rostrata* is said to inhabit principally the Norwegian seas, and to grow to the length of 25 feet. One of the species was killed near Spitzbergen, in the year 1813, some of the whalebone of which I now have in my possession. It is thin,

* Vol. i. p. 201.

fibrous, of a yellowish white colour, and semi-transparent, almost like lantern horns. It is curved like a scymetar, and fringed with white hair on the convex edge and point. Its length is 9 inches; greatest breadth $2\frac{1}{4}$.

THE WHALE FISHERY.

Observations on the Fishery of different latitudes and seasons, and under different circumstances of Ice, Wind and Weather.

It is not yet ascertained what is the earliest period of the year in which it is possible to fish for whales. The danger attending the navigation, amidst massive drift ice in the obscurity of night, is the most formidable objection against attempting the fishery before the middle of the month of April, when the sun, having entered the northern tropic, begins to enlighten the Polar regions throughout the twenty-four hours. Severity of frost, prevalence of storms, and frequency of thick weather, arising from snow and frost rhime, are the usual concomitants of the spring of the year; and these, when combined with the darkness incident to night, a tempestuous sea, and crowded ice, most probably produce as high a degree of horror in the mind of the navigator who is unhappily subjected to their distressful influence, as any combination of circumstances which the imagination can present. Some ships have sailed to the northward of the seventy-eighth degree of latitude, before the close of the month of March; but I am not acquainted with a single instance where the hardy fishers have, at this season, derived any compensation for the extraordinary dangers to which they were exposed. In the course of the month of April, on certain occasions, considerable progress has been made in the fishery, notwithstanding the frequency of storms. At the first stage of the business, in *open* seasons, the whales are usually found in most abundance on the borders of the ice, near Hackluyt's Headland, in the latitude of 80° . A degree or two farther south they are sometimes seen, though not in much plenty; but in the 76th degree, they sometimes occur in such numbers as to present a tolerable prospect of success in assailing them. Some rare instances have occurred, wherein they have been seen on the edge of the ice, extending from Cherry Island to Point-look-out, in the early part of the season.

In the year 1803 the fishery of April was considerable in

the latitude of 80° ; in 1813 many whales were seen in the same latitude; but the weather being tempestuous in an almost unprecedented degree, but few were killed; and in the intermediate years, the fishery was never general in this month, and but seldom begun at all before the commencement of May. In 1814 the fishery commenced before the middle of April, and some ships derived uncommon advantage from an early arrival. In 1815 some ships were near Spitzbergen in March, and fished in the first week of April in the latitude of 80° ; where a great number of whales were seen. Accompanying the ice in its drift along the coast to the southward, the same *tribe* of whales were seen in the latitude of 78° , about the middle and end of the month, and a considerable number were killed. In 1816 fish were seen in 80° , in the same month, but few killed, on account of the formation of bay ice upon the sea. In 1817 the weather was very tempestuous in April, and scarcely any whales were killed; and in 1818 the fishery of this month was inconsiderable.

Grown fish are frequently found at the edge, or a little within the edge of the loose ice, in the 79th degree of north latitude, in the month of May; and small whales of different ages at fields, and sometimes in bays of the ice in the 80th degree.

Usually, the fish are most plentiful in June; and on some occasions they were met with in every degree of latitude from 75° to 80° . In this month the large whales are found in every variety of situation; sometimes in open water, at others in the loose ice, or at the edges of fields and floes, near the main impervious body of ice, extending towards the coast of *West Greenland*. The smaller animals of the species are, at the same time, found farther to the south than in the spring, at floes, fields, or even among loose ice, but most plentiful about fields or floes, at the border of the main western ice, in the latitude of 78 or $78\frac{1}{2}$ degrees.

In July the fishery generally terminates, sometimes at the beginning of the month, at others, though more rarely, it continues throughout the greater part of it. Few small fish are seen at this season. The large whales, when plentiful, are found occasionally in every intermediate situation, between the open sea and the main ice, in one direction, and between the latitudes of 75° and 79° in the other, but rarely as far north as 80° .

The parallel of 78 to $78\frac{1}{2}$ degrees is, on the whole, the most productive fishing station. The interval between this parallel and 80° , or any other situation more remote, is called

the "northward," and any situation in a lower latitude than 78° is called the "southward."

Though the 79^{th} degree affords whales in the greatest abundance, yet the 76^{th} degree affords them, perhaps more generally. In this latter situation, a very large kind of the mysticetus is commonly to be found throughout the season, from April to July inclusive. Their number, however, is not often great; and as the situation in which they occur is unsheltered, and, consequently, exposed to heavy swells, the southern fishery is not much frequented.

The parallel of 77° to $77\frac{1}{2}^{\circ}$ is considered a "dead latitude" by the fishers, but occasionally it affords whales also.

From an attentive observation of facts, it would appear, that different tribes of the mysticetus inhabit different regions and pursue different routes on their removal from the places where first seen. These tribes seem to be distinguished by a difference of age or manners, and in some instances, apparently by a difference of species, or sub-species. The whales seen in the spring in the latitude of 80° , which are usually full grown animals, disappear generally by the end of April; and the place of their retreat is unknown. Those inhabiting the regions of 78° are of a mixed size. Such as resort to fields in May and the beginning of June, are generally young animals; and those seen in the latitude of 76° are almost always of the very largest kind. Instances are remembered by some aged captains, wherein a number have been taken in the *southward* fishing stations, which were astonishingly productive of oil. It is probable that the difference in the appearance of the heads, or the difference of proportion existing between the heads and bodies of some mysticete, are distinguishable of a difference in the species, or sub-species. Those inhabiting southern latitudes have commonly long heads and bodies, compared with their circumference, moderately thick blubber and long whalebone; those of the mean fishing latitude, that is 78° — 79° , have more commonly short broad heads, compared with the size of the body. In some individuals, the head is at least one-third of the whole length of the animal, but in others scarcely two-sevenths. Hence, it is exceedingly probable that the whales seen early in April, in the latitude of 80° , are a peculiar tribe, which do not re-appear during the remainder of the season; and that those inhabiting the latitude of 78° and of 76° , are likewise distinct tribes.

Notwithstanding, if we descend to particulars, the great variety and uncertainty which appear in the nature of the situations preferred by the whales, and the apparent dissimilarity observed in their habits, it is probable that, were the

different tribes distinguished, we should find a much greater degree of similarity in their choice of situation and in their general habits than we are at present able to trace.

Annoyed as the whales are by the fishers, it is not surprising that they sometimes vary their usual places of resort, and it is not improbable, were they left undisturbed for a few years, but that they might return to the bays and sea-coasts of Spitzbergen and its neighbouring islands, as was formerly the custom with certain tribes, at the commencement of this fishery. We are doubtless in a great measure indebted to the necessity they are under of performing the function of respiration in the air, at stated intervals, for being able to meet with them at all; though the coast of Spitzbergen may possibly possess powerful attraction to the mysticete, by affording them a greater abundance of palatable food than the interior western waters, covered perpetually by the ice. From this necessity of respiring in the air, we may account for their appearance in the open sea in the early part of the spring. The ice at this season, connected by the winter's frost, is so consolidated, as to prevent the whales from breathing among it, excepting within so much of its confines as may be broken by the violence of the sea in storms. After the dissolution of the continuity of the ice, by north, northwest, or west winds, they find sufficient convenience for respiration in the interior, and often retreat thither to the great disadvantage of the whalers. In such cases if the formation of bay ice, or the continuity of the border of the heavy ice, prevents the ships from following, the whales completely escape their enemies, until the relaxation of the frost permits an entrance.

It is not uncommon, however, for an adult tribe of whales to resort partially to the open sea, between the latitudes of 76° and 79° , during the months of May and June, and, though more rarely, during the early part of July, when, at length, they suddenly betake themselves to the ice, and disappear altogether.

The systematical movements of the whales receive additional illustration from many well known facts. Sometimes a large tribe, passing from one place to another, which, under such circumstances, is denominated a "run of fish," has been traced in its movements in a direct line from the south towards the north, along the seaward edge of the western ice, through a space of two or three degrees of latitude; then it has been ascertained to have entered the ice, and penetrated to the north-westward, beyond the reach of the fishers. In certain years it is curious to observe that the whales commence a simultaneous retreat throughout the whole fishing limits, and

all disappear within the space of a very few days. On such occasions it has often happened that not a single whale has been seen by any individual belonging to the whole Greenland fleet, after perhaps the middle of June, but more commonly after the first or second week in July, notwithstanding many of the fleet may have cruised about in the fishing region for a month afterward. In the year 1813 whales were found in considerable numbers in the open sea, during the greater part of the fishing season, but in the greatest abundance about the end of June and beginning of July. On the 6th of July they departed into the ice, and were followed by the fishers; several were killed during the three succeeding days, but they wholly disappeared after the 9th. Notwithstanding several ships cruised "the country" for some weeks afterward, in all navigable directions, through an extent of four degrees of latitude, and penetrated the ice as far as the main western body, in different parallels, it does not appear that a single whale was caught, and as far as I was able to learn, but one was seen, and this individual was observed to be rapidly advancing towards the north-west. I do not mention this as an uncommon circumstance, because a similar case occurs frequently, but as a single illustration of the foregoing observation.

When the fishery for the season, in the opinion of the British whalers, has altogether ceased, it appears from the observation of the Dutch,* that it may frequently be recommenced in the autumn, at the verge of the most northern waters, near Hackluyt's Headland. They consider the fish which then appear as the same tribe that are seen in this place in the spring of the year, and enter the ice immediately after it opens in the north. On the recommencement of the frost, they instinctively return to prevent themselves being enclosed so far within the ice, as to occasion suffocation from the freezing up of the openings through which they might otherwise breathe.

This tribe are supposed by the Dutch to be really inhabitants of the sea adjoining West Greenland; that they always retreat thither whenever the state of the ice will admit, and only appear within the observation of the fishers when the solidity of the ice prevents their attaining those favourite situations, where they probably find the most agreeable food.†

The whales of lower latitudes, however, whose food lies near the eastern margin of the main ice, when they enter the

* Beschryving der Walvisvangst, vol. i. p. 52.

† Beschryving, &c. vol. i. p. 53.—As I have never seen whales in this situation in the autumn myself, I give the information entirely on the authority of the work here quoted.

ice in May and June, seem to exhibit an intention of evading their pursuers; for in whatever manner they may retreat for a while, they frequently return to the same or other similar place, accessible to the fishers. But after the month of July, this tribe also penetrates so deeply into the ice, that it gets beyond the reach of its enemies.

Experience proves that the whale has its favourite places of resort, depending on a sufficiency of food, particular circumstances of weather, and particular positions and qualities of the ice. Thus, though many whales may have been seen in open water, when the weather was fine, after the occurrence of a storm perhaps not one is to be seen. And, though fields are sometimes the resort of hundreds of whales, yet, whenever the loose ice around separates entirely away, the whales quit them also. Hence fields seldom afford whales in much abundance, excepting at the time when they first "break out," and become accessible; that is, immediately after a vacancy is made on some side by the separation of adjoining fields, floes, or drift ice. Whales, on leaving fields which have become exposed, frequently retire to other more obscure situations in a west or northwest direction; but occasionally they retreat no further than the neighbouring drift ice, from whence they sometimes return to the fields at regular intervals of six, twelve or twenty-four hours.

Whales are rarely seen in abundance in the large open space of water, which sometimes occurs amidst fields and floes, nor are they commonly seen in a very open pack, unless it be in the immediate neighbourhood of the main western ice. They seem to have a preference for close packs and patches of ice; and for fields under certain circumstances; for deep bays or *bights*, and sometimes for clear water situations; occasionally for detached streams of drift ice; and most generally for extensive sheets of bay ice. Bay ice is a very favourite retreat of the whales, so long as it continues sufficiently tender to be conveniently broken, for the purpose of respiration. In such situations whales may frequently be seen in amazing numbers, elevating and breaking the ice with their *crowns*,* where they are observed to remain much longer at rest than when seen in open water, or in the clear interstices of the ice, or indeed in almost any other situation.

* The eminence on the head of the whale, in which the blow-holes are situated, is thus called.

Description of the boats and principal instruments used in the capture of the whale.

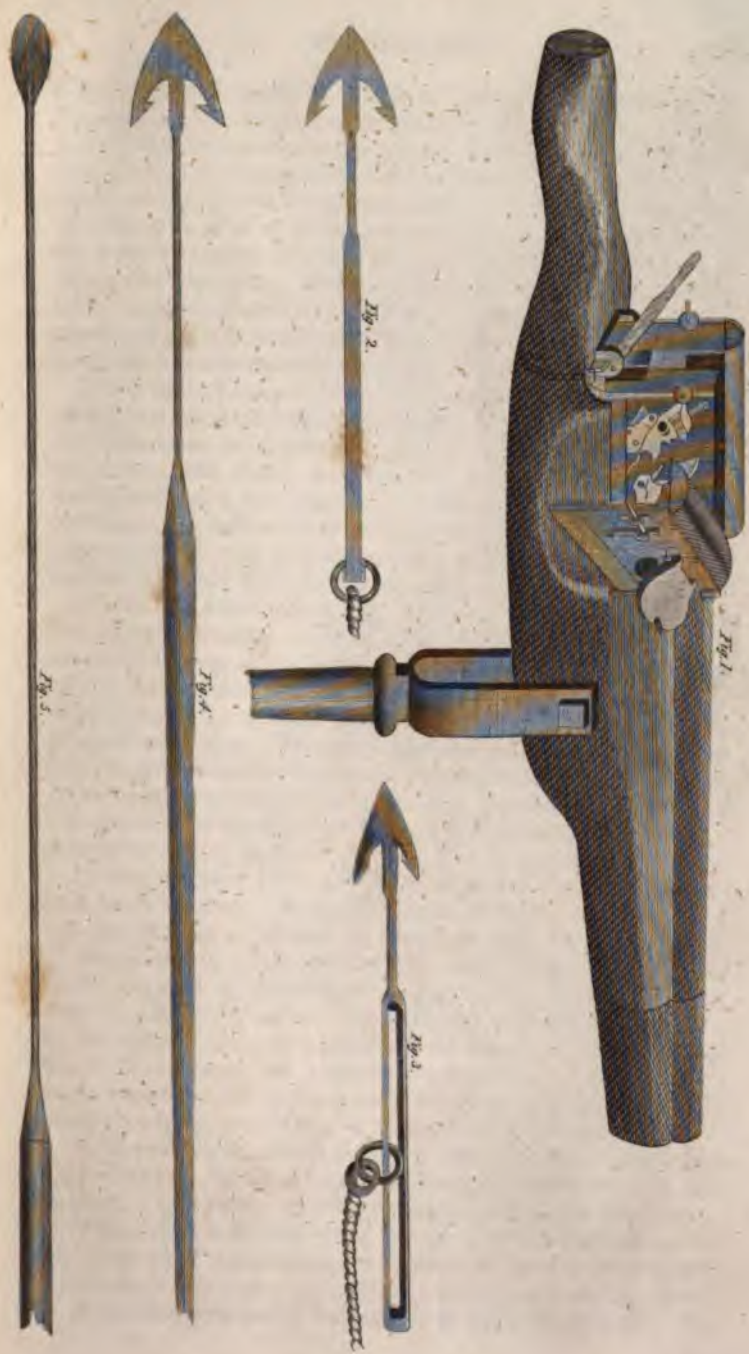
Whale-boats are, of course, peculiarly adapted for the occupation they are intended to be employed in. A well constructed "Greenland boat" possesses the following properties. It floats lightly and safely on the water,—is capable of being rowed with great speed, and readily turned round,—it is of such capacity that it carries six or seven men, seven or eight hundred weight of whale-lines, and various other materials, and yet retains the necessary properties of safety, buoyancy, and speed, either in smooth water, or where it is exposed to a considerable sea. Whale-boats being very liable to receive damage, both from whales and ice, are always *carver-built*,—a structure which is easily repaired. They are usually of the following dimensions. Those called "six oared boats," adapted for carrying seven men, six of whom, including the harpooner, are rowers, are generally 26 to 28 feet in length, and about five feet nine inches in breadth. Six men boats, that is, with five rowers and a steersman, are usually 25 to 26 feet in length, and about five feet six inches in breadth. And "four oared boats" are usually twenty-three to twenty-four in length, and about five feet three inches in breadth. The main breadth of the two first classes of boats is at about three-sevenths of the length of the boat reckoned from the stem; but, in the last class, it is necessary to have the main breadth within one-third of the length of the boat from the stem. The object of this is to enable the smaller boat to support, without being dragged under water, as great a strain on the lines as those of a larger class: otherwise, if such a boat were sent out by itself, its lines would be always liable to be lost before any assistance could reach it. The five oared or six men boat, is that which is in most general use; though each fishing ship generally carries one or two of the largest class. These boats are now commonly built of fir-boards, one-half or three-fourths of an inch thick, with timbers, keel, gun-wales, stem and stern-post of oak. An improvement in the timbering of whale-boats has lately been made, by sawing the timber out of very straight grained oak, and bending them to the required form, after being made supple by the application of steam, or immersion in boiling water. This improvement, which renders the timbers more elastic than when they are sawn out of crooked oak, at the same time makes the boat stronger and lighter. Though the principle has long been acted upon in clincher-built boats, with ash timbers, the application to carver-built whale-boats

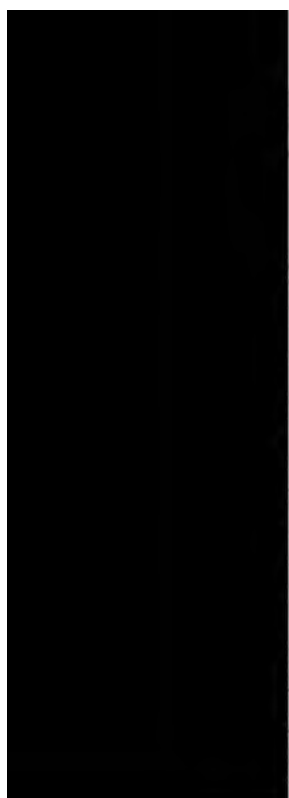
is, I believe, new. The bow and stern of Greenland boats are both sharp, and, in appearance, very similar; but the stern forms a more acute angle than the bow. The keel has some inches depression in the middle, from which the facility of turning is acquired.

The instruments of general use in the capture of the whale are the harpoon and lance.

The harpoon (fig. 4.) is an instrument of iron, of about three feet in length. It consists of three conjoined parts, called the "socket," "shank," and "mouth," the latter of which includes the barbs or "withers." This instrument, if we except a small addition to the barbs, and some enlargement of dimensions, maintains the same form in which it was originally used in the fishery two centuries ago. At that time the mouth or barbed extremity was of a triangular shape, united to the shank in the middle of one of the sides; and this being scooped out on each side of the shank, formed two simple flat barbs. In the course of last century an improvement was made, by adding another small barb, resembling the beard of a fish-hook, within each of the former withers, in a reverse position. The two principal withers, in the present improved harpoon, measure about eight inches in length and six in breadth; the shank is eighteen inches two feet in length, and four-tenths of an inch in diameter, and the socket, which is hollow, swells from the size of the shank to near two inches diameter, and is about six inches in length. Now, when the harpoon is forced by a blow into the fat of the whale, and the line is held tight, the principal withers seize the strong ligamentous fibres of the blubber, and prevent it from being withdrawn; and in the event of its being pulled out, so far as to remain entangled by one wither only, which is frequently the case, then the little reverse barb, or "stop wither," as it is called, collecting a number of the same reticulated sinewy fibres, which are very numerous near the skin, prevents the harpoon from being shaken out by the ordinary motions of the whale. The point and exterior edges of the barbs of the harpoon are sharpened to a rough edge, by means of a file. This part of the harpoon is not formed of steel, as it is frequently represented, but of common soft iron; so that when blunted, it can be readily sharpened by a file, or even by scraping it with a knife. The most important part in the construction of this instrument is the shank. As this part is liable to be forcibly and suddenly extended, twisted and bent, it requires to be made of the softest and most pliable iron. That kind which is of the most approved tenacity is made of old horse-shoe nails or *stubs*, which are formed into small rods, and two or three of these welded together; so that

INSTRUMENTS USED IN THE CAPTURE OF THE WHALE.





should a flaw happen to occur in any one of the rods, the strength of the whole might still be depended on. Some manufacturers enclose a quantity of stub-iron in a cylinder of best foreign iron, and form the shank of the harpoon out of a single rod. A test sometimes used for trying the sufficiency of a harpoon, is to wind its shank round a bolt of inch iron, in the form of a close spiral, then to unwind it again, and put it into a straight form. If it bears this without injury in the cold state, it is considered as excellent. The breaking of a harpoon is of no less importance than the value of a whale, which is sometimes estimated at more than 1000*l.* sterling.

Next in importance to the harpoon is the lance (fig. 5.), which is a spear of iron of the length of six feet. It consists of a hollow socket six inches long, swelling from half an inch, the size of the shank, to near two inches in diameter, into which is fitted a four feet stock or handle of fir; a shank five feet long, and half an inch in diameter; and a mouth of steel, which is made very thin, and exceedingly sharp, seven or eight inches in length, and two or two and a half in breadth.

These two instruments, the harpoon and lance, with the necessary apparatus of lines, boats, and oars, are all that are essential for capturing the whale. But besides these instruments, so successfully used in the whale fishery, there is likewise an auxiliary weapon which has, at different periods been of some celebrity. This is the harpoon gun. It is well calculated to facilitate the capture of whales under particular circumstances, particularly in calm clear weather, when the fish are apt to take the alarm, whenever the boats approach within fifteen or twenty yards of them. The harpoon-gun was invented in the year 1731, and used, it seems, by some individuals with success. Being however, difficult, and somewhat dangerous in its application, it was laid aside for many years. It has, however, subsequently been highly improved, and rendered capable of throwing a harpoon near forty yards with effect; yet, on account of the difficulty and address requisite in the management of it, and loss of fish, which in unskilful hands it has been the means of occasioning, together with some accidents which have resulted from its use,—it has not been so generally adopted as might have been expected.

In its present improved form the harpoon-gun consists of a kind of swivel, having a barrel of wrought iron, 24 to 26 inches in length, of 3 inches exterior diameter, and $1\frac{1}{2}$ inches bore.—It is furnished with two locks, which act simultaneously, for the purpose of diminishing the liability of the gun missing fire. Fig. 1, is a representation of the harpoon gun; and fig. 2, and 3, show the form of the harpoon which is fired from it. The

shank of this harpoon is double, terminating in a cylindrical knob, fitting the bore of the gun. Between the two parts of the shank is a wire ring, to which is attached the line. Now, when the harpoon is introduced into the barrel of the gun, the ring, with the attached line, remains on the outside near the mouth of the harpoon; but the instant that it is fired, the ring flies back against the cylindrical knob. Some harpoons have been lately made with a single shank, similar to the common "hand-harpoon," but swelled at the end to the thickness of the bore of the gun. The whale line, closely spliced round the shank, is slipped towards the mouth of the harpoon, when it is placed in the gun, and when fired, is prevented from disengaging itself by the size of the knob at the end.

Proceedings on Fishing Stations.

On fishing stations, when the weather is such as to render the fishing practicable, the boats are always ready for instant service. Suspended from davits or cranes by the side of the ship, and furnished with the requisite implements, two boats at least, the crews of which are always in readiness, can, in a general way, be manned and lowered into the water within the space of one minute of time.

Wherever there is a probability of seeing whales, when the weather and situation are such as to prevent a possibility of capturing them, the crow's-nest* is generally occupied by the master, or some one of the officers, who, commanding from thence an extensive prospect of the surrounding sea, keeps an anxious watch for the appearance of a whale; assisted by a telescope, he views the operations of any ship which may be in sight at a distance; and occasionally sweeps the horizon with his glass, to extend the limited sphere of vision, in which he is able to discriminate a whale with the naked eye, to an area vastly greater. The moment that a fish is seen, he gives notice to the "watch upon deck," part of whom leap into a boat, are lowered down, and push off towards the place. If

* The crow's-nest is an apparatus placed on the main-topmast, or top-gallant-mast head, as a kind of watch tower for the use of the master, or officer of the watch, in the fishing seas, for sheltering him from the wind, when engaged in piloting the ship through crowded ice, or for obtaining a more extensive view of the sea around, when looking out for whales. In difficult situations a master's presence at the mast-head is sometimes required for many hours in succession, when the temperature of the air is from 10° to 20° below the freezing point, or more. It is therefore necessary for the preservation of his health, as well as his comfort, that he should be sheltered from the gale.

the fish be large, a second boat is immediately despatched to the support of the other. When the whale again appears, two boats row towards it with their utmost speed; and though they may be disappointed in all their attempts, they generally continue the pursuit until the fish either takes the alarm and escapes them, or they are recalled by a signal to the ship.—When two or more fish appear at the same time in different situations, the number of boats sent in pursuit is commonly increased; and when the whole of the boats are sent out, the ship is said to have a “loose fall.”

During fine weather, in situations where whales are seen, or where they have recently been seen, or where there is a great probability of any making their appearance, a boat is generally kept in readiness, manned and afloat. If the ship sails with considerable velocity, this boat is towed by a rope astern; but when the ship is pretty still, whether moored to ice, laid to, or sailing in light winds, the “bran boat,” as it is called, often pushes off to a little distance from the ship. A boat on watch commonly lies still in some eligible situation, with all its oars elevated out of the water, but in readiness in the hands of the rowers for immediate use.

The harpooner and boat steerer keep a careful watch on all sides, while each of the rowers looks out in the direction of his oar. In field fishing, the boats approach the ice with their sterns, and are each of them fastened to it, by means of a boat hook, or an iron spike with a cord attached, either of which is held by the boat-steerer, and is slipped or withdrawn the moment a whale appears. There are several rules observed in approaching a whale, as precautions, to prevent, as far as possible, the animal from taking the alarm. As the whale is dull of hearing, but quick of sight, the boat-steerer always endeavours to get behind it; and, in accomplishing this, he is sometimes justified in taking a circuitous route. In calm weather, where guns are not used, the greatest caution is necessary before a whale can be reached; smooth careful rowing is always requisite, and sometimes sculling is practised.

When it is known that a whale seldom abides longer on the water than two minutes; that it generally remains from five to ten or fifteen minutes under water;* that in this interval it sometimes moves through a space of half a mile or more,—and that the fisher has very rarely any certain intimation of the

* Before I had particularly minuted the time that a whale stays on the surface and remains below, I believed each interval, and especially the former, was much greater than it really is.

place in which it will reappear; the difficulty and address requisite to approach sufficiently near during its short stay on the surface to harpoon it, will readily be appreciated. It is, therefore, a primary consideration with the harpooner always to place his boat as near as possible to the spot in which he expects the fish to rise, and he conceives himself successful in the attempt when the fish "comes up within a start," that is, within the distance of about 200 yards. In all cases when a whale that is pursued has but once been seen, the fisher is considerably indebted to what is called chance for a favourable position. But when the whale has been twice seen, and its change of place, if any, noticed, the harpooner makes the best use of the intimation derived from his observation on its apparent motion, and places his boat accordingly; thus he anticipates the fish in its progress, so that when it rises to the surface there is a probability of its being within the favourable precincts of a start.

A whale moving forward at a small distance beneath the surface of the sea, leaves a sure indication of its situation in what is called an "eddy," having somewhat the resemblance of the "wake" or track of a ship, and in fine calm weather its change of position is sometimes pointed out by the birds, many of which closely follow it when at the surface, and hover over it when below, whose keener vision can discover it when it is totally concealed from human eyes. By these indications many whales have been taken.

Whenever a whale lies on the surface of the water, unconscious of the approach of its enemies, the hardy fisher rows directly upon it; and an instant before the boat touches it, buries his harpoon in its back. But if, while the boat is yet at a little distance, the whale should indicate his intention of diving, by lifting his head above its common level, and then plunging it under water, and raising his body until it appears like the large segment of a sphere,—the harpoon is thrown from the hand, or fired from a gun, the former of which, when skilfully practised, is efficient at the distance of eight or ten yards, and the latter at the distance of thirty yards, or upward. The wounded whale, in the surprise and agony of the moment, makes a convulsive effort to escape. Then is the moment of danger. The boat is subjected to the most violent blows from its head, or its fins, but particularly from its ponderous tail, which sometimes sweeps the air with such tremendous fury, that both boat and men are exposed to one common destruction.

The head of the whale is avoided, because it cannot be penetrated with the harpoon; but any part of the body, be-

tween the head and tail, will admit of the full length of the instrument, without danger of obstruction. The harpoon, therefore, is always struck into the back, and generally well forward towards the fins, thus affording the chance, when it happens to drag and plough along the back, of retaining its hold during a longer time than when struck in closer to the tail.

The moment that the wounded whale disappears, or leaves the boat, a jack or flag, elevated on a staff, is displayed; on sight of which those on watch in the ship give the alarm, by stamping on the deck, accompanied by a simultaneous and continued shout of "a fall;"* at the sound of this the sleeping crew are roused, jump from their beds, rush upon deck, with their clothes tied by a string in their hands, and crowd into the boats, with a temperature of zero. Should a fall occur, the crew would appear upon deck, shielded only by their drawers, stockings, and shirts, or other habiliments in which they sleep. They generally contrive to dress themselves, in part at least, as the boats are lowered down; but sometimes they push off in the state in which they rise from their beds, row away towards the "fast boat," and have no opportunity to clothe themselves for a length of time afterward. The alarm of a "fall" has a singular effect on the feelings of a sleeping person, unaccustomed to the whale-fishing business. It has often been mistaken as a cry of distress. A landsman in a Hull ship, seeing the crew, on an occasion of a fall, rush upon deck, with their clothes in their hands, when there was no appearance of danger, thought the men were all mad; but, with another individual the effect was totally different. Alarmed with the extraordinary noise, and still more so, when he reached the deck, with the appearance of all the crew seated in the boats in their shirts, he imagined the ship was sinking. He therefore endeavoured to get into a boat himself, but every one of them being fully manned, he was always repulsed. After several fruitless endeavours to gain a place among his comrades, he cried out, with feelings of evident distress, "what shall I do?—Will none of you take me in?"

The first effort of a fast-fish, or whale that has been struck, is to escape from the boat, by sinking under water. After this it pursues its course directly downward, or re-appears at a

* The word fall, as well as many others used in the fishery, is derived from the Dutch language. In the original it is written val, implying jump, drop, fall, and is considered as expressive of the conduct of the sailors, when manning the boats on an occasion requiring extreme despatch.

little distance, and swims with great celerity, near the surface of the water, towards any neighbouring ice, among which it may obtain an imaginary shelter; or it returns instantly to the surface, and gives evidence of its agony by the most convulsive throes, in which its fins and tail are alternately displayed in the air, and dashed into the water with tremendous violence. The former behaviour, however, that is, to dive towards the bottom of the sea, is so frequent in comparison of any other, that it may be considered as the general conduct of a fast-fish.

A whale struck near the edge of any large sheet of ice, and passing underneath it, will sometimes run the whole of the lines out of the boat in the space of eight or ten minutes of time. This being the case when the fast boat is at a distance both from the ship and from any other boat, it frequently happens that the lines are all withdrawn before assistance arrives, and, with the fish entirely lost. In some cases, however, they are recovered. To retard, therefore, as much as possible, the flight of the whale, it is usual for the harpooner who strikes it to cast one, two, or more turns of line round a kind of post called a bollard; which is fixed within ten or twelve inches of the stem of the boat for that purpose. Such is the friction of the line, when running round the bollard, that it frequently envelopes the harpooner in smoke; and if the wood were not repeatedly wetted, would probably set fire to the boat. During the capture of one whale, a groove is sometimes cut in the bollard, near an inch in depth; and, were it not for a plate of brass, iron, or a block of *lignum-vitæ* which covers the top of the stem where the line passes over, it is apprehended that the action of the line on the material of the boat, would cut it down to the water's edge, in the course of one season of successful fishing. The approaching distress of a boat, for want of line, is indicated by the elevation of an oar, in the way of a mast, to which is added a second, a third, or even a fourth, in proportion to the nature of the exigence. The utmost care and attention are requisite, on the part of every person in the boat when the lines are running out; fatal consequences having been sometimes produced by the most trifling neglect. When the line happens "to run foul," and cannot be cleared on the instant, it sometimes draws the boat under water; on which, if no auxiliary boat or convenient piece of ice be at hand, the crew are plunged into the sea, and are obliged to trust to the buoyancy of their oars or to their skill in swimming, for supporting themselves on the surface. To provide against such an accident as well as to be ready to furnish an additional supply of lines, it is usual when boats are sent in

pursuit, for two to go out in company; and when a whale has been struck, for the first assisting boat which approaches to join the fast-boat, and to stay by until the fish re-appears. The other boats, likewise make towards the one carrying a flag, and surround it at various distances, awaiting the appearance of the wounded whale.

On my first voyage to the whale-fishery, such an accident as above alluded to occurred. A thousand fathoms of line were already out, and the fast-boat was forcibly pressed against the side of a piece of ice. The harpooner, in his anxiety to retard the flight of the whale, applied too many turns of the line round the bollard, which, getting entangled, drew the boat beneath the ice. Another boat providentially was at hand, into which the crew including myself who happened to be present, had just time to escape. The whale, with near two miles length of line, was, in consequence of the accident lost, but the boat was recovered. On a subsequent occasion I underwent a similar misadventure, but with a happier result; we escaped with a little wetting into an accompanying boat, and the whale was afterward captured, and the boat with its lines recovered.

When fish have been struck by myself, I have on different occasions estimated their rate of descent. For the first 300 fathoms the average velocity was usually after the rate of 8 to 10 miles per hour. In one instance the third line of 120 fathoms was run out in 61 seconds; that is at the rate of $8\frac{1}{4}$ English miles, or $7\frac{1}{8}$ nautical miles per hour. By the motions of the fast-boat, the simultaneous movements of the whale are estimated. The auxiliary boats accordingly take their stations about the situation where the whale, from these motions, may reasonably be expected to appear.

The average stay under water of a wounded whale, which steadily descends after being struck, according to the most usual conduct of the animal, is about 30 minutes. The longest I ever observed was 56 minutes; but in shallow water, I have been informed, it has sometimes been known to remain an hour and a half at the bottom after being struck, and yet has returned to the surface alive. The greater the velocity, the more considerable the distance to which it descends, and the longer the time it remains under water, so much greater in proportion is the extent of its exhaustion and the consequent facility of accomplishing its capture. Immediately that it reappears, the assisting boats make for the place with their utmost speed, and as they reach it each harpooner plunges his harpoon into its back to the amount of three, four, or more, according to the size of the whale and the na-

ture of the situation. Most frequently, however, it descends for a few minutes after receiving the second harpoon, and obliges the other boats to await its return to the surface before any farther attack can be made. It is afterwards actively plied with lances, which are thrust into its body aiming at its vitals. At length, when exhausted by numerous wounds and the loss of blood, which flows from the huge animal in copious streams, it indicates the approach of its dissolution by discharging from its "blowholes" a mixture of blood along with the air and mucus which it usually expires, and finally jets of blood alone. The sea, to a great extent around, is dyed with blood, and the ice, boats, and men are sometimes drenched with the same. Its track is likewise marked by a broad pellicle of oil, which exudes from its wounds, and appears on the surface of the sea. Its final capture is sometimes preceded by a convulsive struggle, in which its tail, reared, whirled, and violently jerked in the air, resounds to the distance of miles. In dying it turns on its back or on its side; which joyful circumstance is announced by the capturers with the striking of their flags, accompanied by three lively huzzas!

The remarkable exhaustion observed in the first appearance of a wounded whale at the surface, after a descent of 7 or 800 fathoms perpendicular, does not depend on the nature of the wound it has received; for a hundred superficial wounds received from harpoons, could not have the effect of a single lance penetrating the vitals, but is the effect of the almost incredible pressure to which the animal must have been exposed. The surface of the body of a large whale may be considered as comprising an area of 1540 square feet. This, under the common weight of the atmosphere only, must sustain a pressure of 3,104,640 pounds, or 1386 tons. But at the depth of 800 fathoms, where there is a column of water equal in weight to about 154 atmospheres, the pressure on the animal must be equal to 211,200 tons.* This is a degree of pressure of which we can have but an imperfect conception. It

* From experiments made with seawater taken up near Spitzbergen, I find that 35 cubical feet weigh a ton. Now supposing a whale to descend to the depth of 800 fathoms, or 4800 feet, which, I believe, is not uncommon, we have only to divide 4800 feet, the length of the column of water pressing upon the whale, by 35 feet, the length of a column of seawater a foot square, weighing a ton, the quotient 137 1-7, shows the pressure per square foot upon the whale, in tons; which, multiplied by 1540, the number of square feet of surface exposed by the animal, affords a product of 211,200 tons, besides the usual pressure of the atmosphere.

may assist our comprehension however, to be informed, that it exceeds in weight sixty of the largest ships of the British navy when manned, provisioned, and fitted for a six months' cruise.

Every boat fast to a living whale carries a flag, and the ship to which such boats belong also wears a flag until the whale is either killed or makes its escape. These signals serve to indicate to surrounding ships the exclusive title of the "fast ship" to the entangled whale, and to prevent their interference excepting in the way of assistance in the capture.

A very natural inquiry connected with this subject is, what is the length of time requisite for capturing a whale? This is a question which can only be answered indirectly; for I have myself witnessed the capture of a large whale, which has been effected in twenty-eight minutes; and have also been engaged with another fish which was lost after it had been entangled about sixteen hours. Instances are well authenticated, in which whales have yielded their lives to the lances of active fishers, within the space of fifteen minutes from the time of being struck; in cases when the fish have been shot with a harpoon gun, in a still shorter period; while other instances are equally familiar and certain, wherein a whale having gained the shelter of a pack or compact patch of ice, has sustained or avoided every attack upon it during the space of forty or fifty hours. Some whales have been captured when very slightly entangled with a single harpoon, while others have disengaged themselves, though severely wounded with lances, by a single act of violent and convulsive distortion of body, or tremendous shake of the tail, from four or more harpoons; in which act some of the lines have been broken with apparent ease, and the harpoons, to which other lines were attached, either broken, or torn out of the body of the vigorous animal. Generally the speedy capture of a whale depends on the activity of the harpooners, the favourableness of situation and weather, and, in no inconsiderable degree, on the peculiar conduct of the whale attacked. Under the most favourable circumstances, namely, when the fishermen are very active, the ice very open, or the sea free from ice and the weather very fine—the average length of time occupied in the capture of a whale may be stated as not exceeding an hour.*

* Twelve large whales, taken in different voyages, memoranda of whose capture I have preserved, were killed on an average of 67 minutes. The shortest time expended in the taking of one of the twelve whales was 28 minutes, the longest time 2 hours. One of these whales we believed descended 670 fathoms perpendicularly; another

The general average, including all sizes of fish, and all circumstances of capture, may probably be two or three hours.

The method practised in the capture of whales, under favourable circumstances, is very uniform with all the fishers, both British and foreigners; the only variation observable in the proceedings of the different fishers consisting in the degree of activity and resolution displayed, in pursuance of the operations of harpooning and lancing the whale, and in the address manifested in improving by any accidental movement of the fish which may lay it open to an effectual attack,—rather than in any thing different or superior in the general method of conducting the fishery. It is true, that with some the harpoon-gun is much valued, and used with advantage, while with others it is held in prejudiced aversion; yet, as this difference of opinion affects only the first attack and entanglement of the whale, the subsequent proceedings with all the fishers may still be said to be founded on equal and unanimous principles. Hence, the mode described in the preceding pages of conducting the fishery for whales under favourable circumstances, may be considered as the general plan pursued by all the fishers of all the ports of Britain, as well as those of the nations who resort to Spitzbergen. Neither is there any difference in the plan of attack, or mode of capture between fish of large size and those of lesser growth; the proceedings are the same, but, of course, with the smaller whales less force is requisite; though it sometimes happens, that the trouble attached to the killing of a very small whale exceeds that connected with the capture of one of the largest individuals. The progress or flight of a large whale cannot be restrained; but that of an under size fish may generally be confined within the limits of 400 to 600 fathoms of line. A full grown fish generally occupies the whole, or nearly the whole, of the boats belonging to one ship in its capture; but three, four, or sometimes more small fish have been killed at the same time by six or seven boats. It is not unusual for small whales to run downward, until they exhaust themselves so completely, that they are not able to return to the surface, but are suffocated in the water. As it is requisite that a whale that has been drowned should be drawn up by the line, which is a tedious and troublesome operation, it is usual to guard against such an event by resisting its descent with a light strain on the line, and also by hauling upon the line, the mo-

720; and a third 750, one descended 1400 fathoms obliquely, and another 1600 fathoms.

ment its descent is stopped, with a view of irritating the wound, and occasioning such a degree of pain, as may induce it to return to the surface, where it can be killed and secured without further trouble. Seldom more than two harpoons are struck into an under size whale.

The ease with which some whales are subdued, and the slightness of the entanglement by which they are taken, is truly surprising; but with others it is equally astonishing, that neither line nor harpoon, nor any number of each is sufficiently strong to effect their capture. Many instances have occurred where whales have escaped, from four, five, or even more harpoons, while fish, equally large, have been killed through the medium of a single harpoon. Indeed, whales have been taken in consequence of the entanglement of a line, without any harpoon at all; though, when such a case has occurred, it has evidently been the result of accident. The following instances are in point.

A whale was struck from one of the boats of the ship *Nautilus*, in Davis's Straits. It was killed, and as is usual after the capture, it was disentangled of the line connected with the "first fast-boat," by dividing it at the splice of the foreganger, within eight or nine yards of the harpoon. The crew of the boat from which the fish was first struck, in the meantime were employed in heaving in the lines, by means of a winch fixed in the boat for the purpose, which they progressively effected for some time. On a sudden, however, to their great astonishment, the lines were pulled away from them, with the same force and violence, as by a whale when first struck. They repeated their signal, indicative of a whale being struck; their shipmates flocked towards them, and while every one expressed a similar degree of astonishment with themselves, they all agreed that a fish was fast to the line. In a few minutes, they were agreeably confirmed in their opinion, and relieved from suspense, by the rising of a large whale close by them, exhausted with fatigue, and having every appearance of a fast-fish. It permitted itself to be struck by several harpoons at once, and was speedily killed. On examining it after death, for discovering the cause of such an interesting accident, they found the line belonging to the above mentioned boat, in its mouth, where it was still firmly fixed by the compression of its lips. The occasion of this happy and puzzling accident was therefore solved;—the end of the line, after being cut from the whale first killed, was in the act of sinking in the water; the fish in question, engaged in feeding, was advancing with its mouth wide open, and accidentally caught the line between its extended jaws;—a sensation so utterly

unusual as that produced by the line had induced it to shut its mouth and grasp the line, which was the cause of its alarm, so firmly between its lips, as to produce the effect just stated. This circumstance took place many years ago, but a similar one occurred in the year 1814.

A harpooner belonging to the Prince of Brazil, of Hull, had struck a small fish. It descended, and remained for some time quite, and at length appeared to be drowned. The strain on the line being then considerable, it was taken to the ship, with a view of heaving the fish up. The force requisite for performing this operation, was extremely various; sometimes, the line came in with ease, at others, a quantity was withdrawn with great force and rapidity. As such, it appeared evident that the fish was yet alive. The heaving, however, was persisted in, and after the greater part of the lines had been drawn on board, a dead fish appeared at the surface, secured by several turns of the line round its body. It was disentangled with difficulty, and was confidently believed to be the whale they had struck. But when the line was cleared from the fish, it proved to be merely the "bight," for the end still hung perpendicularly downward. What was then their surprise to find that it was still pulled away with considerable force. The capstern was again resorted to, and shortly afterward, they hove up, also dead, the fish originally struck, with the harpoon still fast. Hence it appeared that the fish first drawn up had got accidentally entangled with the line, and, in its struggles to escape, had still further involved itself, by winding the line repeatedly round its body. The first fish entangled, as was suspected, had long been dead; and it was this lucky interloper, that occasioned the jerks and other singular effects observed on the line.

Alterations produced in the manner of conducting the Fishery, by peculiar Circumstances of Situation and Weather.

Hitherto I have only attempted to describe the method adopted for the capture of whales, under favourable circumstances, such as occur in open water or amongst open ice in fine weather; as, however, this method is subject to various alterations, when the situation and circumstances are peculiar, I shall venture a few remarks on this subject.

1. *Pack-fishing.*—The borders of close packs of drift ice are frequently a favourable resort of large whales. To attack them in such a situation subjects the fisher to great risk in his lines and boats, as well as uncertainty in effecting their capture.

When a considerable swell prevails on the boarders of the ice, the whales, on being struck, will sometimes recede from the pack, and become the prize of their assailers; but most generally flee to it for shelter, and frequently make their escape. To guard against the loss of lines as much as possible, it is pretty usual either to strike two harpoons from different boats at the same moment, or to bridle the lines of a second boat upon those of the boat from which the fish is struck. This operation consists in fixing other lines to those of the fast-boat, at some distance from the harpoon, so that there are only one harpoon and one line immediately attached to the fish, but the double strength of a line from the place of their junction to the boats. Hence, should fish flee directly into the ice, and proceed to an inaccessible distance, the two boats, bearing an equal strain on each of their lines, can at pleasure draw the harpoon, or break the single part of the line immediately connected with it, and in either case secure themselves against any considerable loss.

When a pack, for its compactness, prevents boats from penetrating, the men travel over the ice, leaping from piece to piece, in pursuit of the entangled whale. In this pursuit they carry lances with them, and sometimes harpoons, with which, whenever they can approach the fish, they attack it, and if they succeed in killing it, they drag it towards the exterior margin of the ice by means of the line fastened to the harpoon with which it was originally struck. In such cases it is generally an object of importance to sink it beneath the ice; for effecting which purpose each lobe of the tail is divided from the body, excepting a small portion of the edge, from which it hangs pendulous in the water. If it still floats, bags of sand, kedges or small cannon are suspended by a block on the bight of the line, wherewith the buoyancy of the dead whale is usually overcome. It then sinks, and is easily hauled out by the line into the open sea.

To particularize all the variety of pack-fishing, arising from winds and weather, size of the fish, state and peculiarities of the ice, &c. would require more space than the interest of the subject, to general readers, would justify. I shall, therefore, only remark, that pack-fishing is, on the whole, the most troublesome and dangerous of all others;—that instances have occurred of fish having been entangled during 40 or 50 hours, and having escaped after all;—and that other instances are remembered of ships having lost the greater part of their stock of lines, several of their boats, and sometimes, though happily less commonly, some individuals of their crews.

2. *Field-fishing.*—The fishery for whales, when conducted

at the margin of those wonderful sheets of solid ice called fields, is, when the weather is fine, and the refuge for ships secure, of all other situations which the fishery of Greenland presents, the most agreeable and sometimes the most productive. A fish struck at the margin of a large field of ice generally descends obliquely beneath, it takes four to eight lines from the fast-boat, and then returns exhausted to the edge. It is then attacked in the usual way, with harpoons and lances, and is easily killed. There is one evident advantage in field-fishing which is this: when the fast-boat lies at the edge of a firm broken field, and the line proceeds in an angle beneath the ice, the fish must necessarily arise somewhere in a semicircle, described from the fast-boat as a centre, with a sweep not exceeding the length of the lines out; but most generally it appears in a line extending along the margin of the ice, so that the boats, when dispersed along the edge of the field, are effectual, and as ready for promoting the capture as twice the number of boats or more, when fishing in open situations; because, in open situations, the whale may arise anywhere within a circle, instead of a semicircle, described by the length of the lines withdrawn from the fast-boat; whence it frequently happens that all the attendant boats are disposed in a wrong direction, and the fish recovers its breath, breaks loose, and escapes before any of them can secure it by a second harpoon. Hence, when a ship fishes at a field with an ordinary crew and six or seven boats, two of the largest fish may be struck at the same time with every prospect of success; while the same force attempting the capture of two at once in an open situation, will, not unfrequently, occasion the loss of both. There have indeed been instances of a ship's crew, with seven boats, striking at a field, six fish at the same time, and of success in killing the whole. Generally speaking, six boats at a field are capable of performing the same execution as near twice that number in open situations. Besides, fields sometimes afford an opportunity of fishing, when in any other situation there can be little or no chance of success, or, indeed, when to fish elsewhere is utterly impracticable. Thus calms, storms, and fogs are great annoyances in the fishery in general, and frequently prevent it altogether; but at fields the fishery goes on under any of these disadvantages. As there are several important advantages attending the fishery at fields, so, likewise, there are some serious disadvantages, chiefly relating to the safety of the ships engaged in the occupation. The motions of fields are rapid, various, and unaccountable, and the power with which they approach each other, and squeeze every resisting object, immense,—hence

occasionally vast mischief is produced, which it is not always in the power of the most skilful and attentive master to foresee and prevent.

Such are the principal advantages and disadvantages of fields of ice to the whale-fishers. The advantages, however, as above enumerated, though they extend to large floes, do not extend to small floes, or to such fields, how large soever they may be, as contain tracks or holes, or are filled up with thin ice on the interior. Large and firm fields are the most convenient, and likewise the most advantageous for the fishery; the most convenient, because the whales, unable to breathe beneath a close extensive field of ice, are obliged to make their appearance again above water among the boats on the look out; and they are most advantageous, because not only the most fish commonly resort to them, but a greater number can be killed with less force, and in a shorter space of time, than in any other situation. Thin fields, or fields full of holes, being by no means advantageous to fish by, are usually avoided, because a "fast-fish" retreating under such a field can respire through the holes in the centre as conveniently as on the exterior; and a large fish usually proceeds from one hole to another, and if determined to advance cannot possibly be stopped. In this case, all that can be done is to break the line or draw the harpoon out. But when the fish can be observed "blowing" in any of the holes in a field, the men travel over the ice and attack it with lances, pricking it over the nose, to endeavour to turn it back. This scheme, however, does not always answer the expectations of the fishers, as frequently the fear of his enemies acts so powerfully on the whale, that he pushes forward to the interior to his dying moment. When killed, the same means are used as in pack-fishing to sink it, but they do not always succeed; for the harpoon is frequently drawn out, or the line broken in the attempt. If, therefore, no attempt to sink the fish avails, there is scarcely any other practicable method of making prize of it (unless when the ice happens to be so thin that it can be broken with a boat, or a channel readily cut in it with an ice saw,) than cutting the blubber away, and dragging it piece by piece across the ice to the vessel, which requires immense labour, and is attended with vast loss of time. Hence, we have a sufficient reason for avoiding such situations whenever fish can be found elsewhere. As connected with this subject, I cannot pass over a circumstance which occurred within my own observation, and which excited my highest admiration.

On the 8th of July 1813, the ship *Esk* lay by the edge of a large sheet of ice, in which were several thin parts and some

holes. Here a fish being heard blowing, a harpoon with a line connected to it was conveyed across the ice from a boat on guard, and the harpooner succeeded in striking the whale, at the distance of 350 yards from the verge. It dragged out ten lines, (2400 yards) and was supposed to be seen blowing in different holes in the ice. After some time it happened to make its appearance on the exterior, when a harpoon was struck at the moment it was on the point of proceeding again beneath. About a hundred yards from the edge it broke the ice where it was a foot in thickness with its crown, and respired through the opening. It then determinately pushed forward, breaking the ice as it advanced, in spite of the lances constantly directed against it. It reached at length a kind of basin in the field, where it floated on the surface of the water, without any incumbrance from ice. Its back being fairly exposed, the harpoon struck from the boat on the outside, was observed to be so slightly entangled, that it was ready to drop out. Some of the officers lamented this circumstance, and expressed a wish that the harpoon were better fast, observing, at the same time, that if it should slip out the fish would either be lost, or they would be under the necessity of flensing it where it lay, and of dragging the pieces of blubber over the ice to the ship; a kind and degree of labour every one was anxious to avoid. No sooner was the wish expressed, and its importance made known, than one of the sailors, a smart and enterprising fellow, stepped forward and volunteered his services to strike it better in. Not at all intimidated by the surprise which was manifested in every countenance by such a bold proposal, he pulled out his pocket-knife, leaped upon the back of the living whale, and immediately cut the harpoon out. Stimulated by this courageous example, one of his companions proceeded to his assistance. While one of them hauled upon the line and held it in his hands the other set his shoulder against the extremity of the harpoon, and though it was without a stock he contrived to strike it again into the fish more effectually than it was at first; the fish was in motion before they finished. After they got off its back it advanced a considerable distance breaking the ice all the way, and survived this uncommon treatment ten or fifteen minutes. This admirable act was an essential benefit. The fish fortunately sunk spontaneously after being killed, on which it was hauled out to the edge of the ice by the line, and secured without further trouble. It proved a stout whale, and a very acceptable prize.

When a ship approaches a considerable field of ice, and finds whales, it is usual to moor to the leeward side of it, from

which the adjoining ice usually first separates. Boats are then placed on watch, on each side of the ship, and stationed at intervals of 100 or 150 yards from one another, along the edge of the ice. Hence, if a fish arises any where between the extreme boats, it seldom escapes unhurt. It is not uncommon for a great number of ships to moor to the same sheet of ice. When the whale-fishery of the Hollanders was in a flourishing state, above 100 sail of ships might sometimes be seen moored to the same field of ice, each having two or more boats on watch. The field would in consequence be so nearly surrounded with boats, that it was almost impossible for a fish to rise near the verge of the ice without being within the limits of a start of some of them.

3. *Fishing in crowded ice or in open packs.*—In navigably open drift ice, or among small detached streams and patches, either of which serve in a degree to break the force of the sea, and to prevent any considerable swell from arising, we have a situation which is considered one of the best possible for conducting the fishery in; consequently it comes under the same denomination as those favourable situations in which I have first attempted to describe the proceedings of the fishers in killing the whale. But the situation I now mean to refer to is, when the ice is crowded and nearly close; so close indeed that it scarcely affords room for boats to pass through it, and by no means sufficient space for a ship to be navigated among it. This kind of situation occurs in somewhat open packs, or in large patches of crowded ice, and affords a fair probability of capturing a whale, though it is seldom accomplished without a considerable degree of trouble. When the ice is very crowded, and the ship cannot sail into it with propriety, it is usual to seek out for a mooring to some large mass of ice, if such can be found, extending two or three fathoms or more under water. A piece of ice of this kind is capable not only of holding the ship "head-to-wind," but also to windward of the smaller ice. The boats then set out in chase of any fish which may be seen; and when one happens to be struck, they proceed in the capture in a similar manner as when in more favourable circumstances, excepting so far as the obstruction which the quality and arrangement of the ice may offer to the regular system of proceeding. Among crowded ice for instance, the precise direction pursued by the fish is not easily ascertained, nor can the fish itself be readily discovered on its first arrival at the surface after being struck, on account of the elevation of the intervening masses of ice, and the great quantity of line it frequently takes from the fast-boat. Success in such a situation depends on the boats being

spread widely abroad, and on a judicious arrangement of each boat; on a keen look out on the part of the harpooners in the boat, and on their occasionally taking the benefit of a hummock of ice, from the elevation of which the fish may sometimes be seen "blowing" in the interstices of the ice; on pushing or rowing the boats with the greatest imaginable celerity towards the place where the fish may have been seen; and, lastly, on the exercise of the highest degree of activity and despatch in every proceeding.

If these means be neglected, the fish will generally have taken his breath, renewed its strength, and removed to some other quarter before the arrival of the boats; and it is often remarked that if there be one part of the ice more crowded or more difficult of access than another, it commonly retreats thither for refuge. In such cases, the sailors find much difficulty in getting to it with their boats, having to separate many pieces of ice before they can pass through between them. But when it is not practicable to move the pieces, and when they cannot travel over them, they must either drag the boats across the intermediate ice, or perform an extensive circuit before they can reach the opposite side of the close ice, into which the whale has retreated.

A second harpoon in this case, as indeed in all others, is a material point. They proceed to lance whenever a second harpoon is struck, and strike more harpoons as the auxiliary boats progressively arrive at the place.

When the fish is killed, it is often at a distance from the ship, and so circumstanced, that the ship cannot get near it. In such cases the fish must be towed by the boats of the ship; an operation which, in crowded ice, is most troublesome and laborious.

4. *Bay-ice fishing*.—Bay-ice constitutes a situation which, though not particularly dangerous, is yet, on the whole, one of the most troublesome in which whales are killed. In sheets of bay-ice, the whales find a very effectual shelter; for so long as the ice will not "carry a man," they cannot be approached with a boat, without producing such a noise as most certainly warns them of the intended assault. And if a whale, by some favourable accident, were struck, the difficulties of completing the capture are always numerous, and sometimes prove insurmountable. The whale having free locomotion beneath the ice, the fishers pursue it under great disadvantage. The fishers cannot push their boats towards it but with extreme difficulty; while the whale, invariably warned by the noise of their approach, possesses every facility for avoiding its enemies. In the year 1813, I adopted a new plan of fishing in bay-ice, which was attended with the most fortunate result.—

The ship under my command (the *Esk* of Whitby) was frozen into a sheet of bay-ice, included in a triangular space, formed by massive fields and floes. Here a number of small whales were seen sporting around us, in every little hole or space in the bay-ice, and occasionally they were observed to break through it for the purpose of breathing. In various little openings, free of ice, near the ship, few of which were twenty yards in diameter, we placed boats; each equipped with a harpoon and lines, and directed by two or three men. They had orders to place themselves in such a situation, that if a fish appeared in the same opening, they could scarcely fail of striking it. Previous to this I provided myself with a pair of ice-shoes, consisting of two pieces of thin deal, six feet in length, and seven in breadth. They were made very thin at both ends, and in the centre of each was a hollow place exactly adapted for the reception of the sole of my boot, with a loop of leather for confining the toes. I was thus enabled to retain the ice-shoes pretty firmly to my feet, when required, or, when I wished it, of disengaging them in a moment. Where the ice was smooth, it was easy to move in a straight line; but in turning I found a considerable difficulty, and required some practice before I could effect it without falling. I advanced with tolerable speed when the ice was level on the surface, by sliding the shoes alternately forward, but when I met with rough hilly places, I experienced great inconvenience. When, however, the rough places happened to consist of strong ice, which generally was the case, I stepped out of my ice-shoes, until I reached a weaker part. Equipped with this apparatus I travelled safely over the ice which had not been frozen above twenty-four hours, and which was incapable of supporting the weight of the smallest boy in the ship.

Whenever a fish was struck, I gave orders to the harpooner, in running the lines, to use every means of drowning it; the trouble of hauling it up, under the circumstances in which the ship was placed, being a matter of no consideration. This was attempted, by holding a steady tight strain on the line, without slacking it or jerking it unnecessarily, and by forbearing to haul at the line when the fish was stopped. By this measure, one fish, the stoutest of the three we got, was drowned.—When others were struck, and the attempt to drown them failed, I provided myself with a harpoon, and, observing the direction of the line, travelled towards the place where I expected the fish to rise. A small boat was launched, more leisurely, in the same direction for my support; and whenever the ice in my track was capable of supporting a man, assistance was afforded me in dragging the line. When the wound-

ed fish appeared, I struck my harpoon through the ice, and then, with some occasional assistance, proceeded to lance it, until it was killed. At different times the fish rose beneath my feet, and broke the ice on which I stood; on one occasion, when the ice was fortunately more than usually strong, I was obliged to leave my ice-shoes and skip off. In this way we captured three fish, and took their produce on board, while several ships near us made not the least progress in the fishery. After they were killed, we had much trouble in getting them to the ship, but as we could not employ ourselves to advantage in any other way, we were well satisfied with the issue. This part of the business, however, I could not effect alone, and all hands who were occasionally employed in it broke through the ice. Some individuals broke in two or three times, but no serious accident ensued. As a precaution, we extended a rope from man to man, which was held in the hands of each in their progress across the ice, and which served for drawing those out of the water who happened to break through.— Sometimes ten or a dozen of them would break in at once; but so far was such an occurrence from exciting distress, that each of their companions indulged a laugh at their expense, notwithstanding they, probably, shared the same fate a minute or two afterward. The shivering tars were, in general, amply repaid for the drenching they had suffered, by a dram of spirits, which they regularly received on such occasions. I have seen instances, indeed, of sailors having voluntarily broken through the ice, for the mere purpose of receiving the usual precious beverage.

5. *Fishing in storms.*—Excepting in situations sheltered from the sea by ice, it would be alike useless and presumptuous to attempt to kill whales during a storm. Cases, however, occur, wherein fish that were struck during fine weather, in winds which do not prevent the boats from plying about, remain entangled, but unsubdued, after the commencement of a storm. Sometimes the capture is completed, at others the fishers are under the necessity of cutting the lines, and allowing the fish to escape. Sometimes, when they have succeeded in killing it, and in securing it during the gale with a hawser to the ship, they are enabled to make a prize of it on the return of moderate weather; at others, after having it to appearance secured, by means of a sufficient rope, the dangerous proximity of a lee pack constrains them to cut it adrift and abandon it, for the preservation of their vessel. After thus being abandoned, it becomes the prize of the first who gets possession of it, though it be in the face of the original capturers. A storm commencing while the boats are engaged

with an entangled fish sometimes occasions serious disasters. Generally, however, though they suffer the loss of the fish, and perhaps some of their boats and materials, yet the men escape with their lives.

6. *Fishing in foggy weather.*—The fishery in storms, in exposed situations, can never be voluntary, as the case only happens when a storm arises subsequent to the time of a fish being struck; but in foggy weather, though occasionally attended with hazard, the fishery is not altogether impracticable. The fogs, which occur in the icy regions in June and July, are generally dense and lasting. They are so thick, that objects cannot be distinguished at the distance of 100 or 150 yards, and frequently continue for several days without attenuation. To fish with safety and success, during a thick fog, is, therefore, a matter of difficulty, and of still greater uncertainty. When it happens that a fish conducts itself favourably, that is, descends almost perpendicularly, and on its return to the surface remains nearly stationary, or moves round in a small circle, the capture is usually accomplished without hazard or particular difficulty; but when, on the contrary, it proceeds with any considerable velocity in a horizontal direction, or obliquely downwards, it soon drags the boats out of sight of the ship, and shortly so confounds the fishers in the intensity of the mist, that they lose all traces of the situation of their vessel. If the fish, in its flight, draws them beyond the reach of the sound of a bell, or a horn, their personal safety becomes endangered; and if they are removed beyond the sound of a cannon, their situation becomes extremely hazardous, especially if no other ships happen to be in the immediate vicinity. Meanwhile, whatever may be their imaginary or real danger, the mind of their commander must be kept in the most anxious suspense until they are found; and whether they may be in safety, or near perishing with fatigue, hunger, and cold, so long as he is uncertain, his anxiety must be the same. Hence it is, that feelings excited by uncertainty are frequently more violent and distressing than those produced by the actual knowledge of the truth.

Keen and vigilant observance of the direction pursued by the whale, on the part of the persons engaged in the chase, and a corresponding observance of the same by their commanders, can be the only means within the power of each party of securing the ship and boats from being widely separated, without knowing what course to pursue for re-uniting them. Much depends on the people employed in the boats using every known means to arrest the progress of the fish in its flight, by attacking it with the most skilful, active, and per-

severing efforts, until it is killed; and then, as speedily as may be, of availing themselves of the intimation they may possess relative to the position of the ship, for the purpose of rejoining her. But as their knowledge of the direction of their movements generally depends on the wind, unless they happen to be provided with a compass, and have attentively marked their route by its indications, any change in the direction of the wind must be attended with serious consequences.

Anecdotes illustrative of Peculiarities in the Whale Fishery.

On the 25th of June, 1812, one of the harpooners belonging to the *Resolution*, of Whitby, under my command, struck a whale by the edge of a small floe of ice. Assistance being promptly afforded, a second boat's lines were attached to those of the fast-boat; in a few minutes after the harpoon was discharged. The remainder of the boats proceeded to some distance, in the direction the fish seemed to have taken. In about a quarter of an hour the fast-boat, to my surprise, again made a signal for lines. As the ship was then within five minutes sail, we instantly steered towards the boat, with the view of affording assistance, by means of a spare boat we still retained on board. Before we reached the place, however, we observed four oars displayed in signal order, which, by their number, indicated a most urgent necessity for assistance. Two or three men were, at the same time, seated close by the stern, which was considerably elevated, for the purpose of keeping it down,—while the bow of the boat, by the force of the line, was drawn down to the level of the sea,—and the harpooner, by the friction of the line round the bollard, was enveloped in smoky obscurity. At length, when the ship was scarcely 100 yards distant, we perceived preparations for quitting the boat. The sailor's *pea-jackets* were cast upon the adjoining ice,—the oars were thrown down,—the crew leaped overboard,—the bow of the boat was buried in the water,—the stern rose perpendicular, and then majestically disappeared. The harpooner having caused the end of the line to be fastened to the iron ring at the boat's stern, was the means of its loss;* and a *tongue* of the ice, on which was

* "Giving a whale the boat," as the voluntary sacrifice of a boat is termed, is a scheme not unfrequently practised by the fisher, when in want of line. By submitting to this risk, he expects to gain the fish, and still has the chance of recovering his boat and its materials. It is only practised in open ice or at fields.

a depth of several feet of water, kept the boat, by the pressure of the line against it, at such a considerable distance as prevented the crew from leaping upon the floe. Some of them were, therefore, put to the necessity of swimming for their preservation, but all of them succeeded in scrambling upon the ice, and were taken aboard of the ship a few minutes afterward. I may here observe, that it is an uncommon circumstance for a fish to take more than two boats' lines in such a situation;—none of our harpooners, therefore, had any scruple in leaving the fast-boat, never suspecting, after it had received the assistance of one boat, with six lines or upwards, that it would need any more.

Several ships being about us, there was a possibility that some person might attack and make a prize of the whale, when it had so far escaped us that we no longer retained any hold of it; as such, we set all sail the ship could safely sustain, and worked through several narrow and intricate channels in the ice, in the direction I observed the fish had retreated. After a little time, it was descried by the people in the boats, at a considerable distance to the eastward; a general chase immediately commenced, and in the space of an hour three harpoons were struck. We now imagined the fish was secure, but our expectations were premature. The whale resolutely pushed beneath a large floe that had recently been broke to pieces by the swell, and soon drew all the lines out of the second fast-boat, the officer of which, not being able to get any assistance, tied the end of his line to a hummock of ice, and broke it. Soon afterward, the other two boats, still *fast*, were dragged against the broken floe, when one of the harpoons drew out. The line of only one boat, therefore, remained fast to the fish, and, with six or eight lines out, was dragged forward into the shattered floe with astonishing force. Pieces of ice, each of which was sufficiently large to have answered the purpose of mooring a ship, were wheeled about by the strength of the whale; and such was the tension and elasticity of the line, that whenever it slipped clear of any mass of ice, after turning it round, into the space between any two adjoining pieces, the boat and its crew flew forward through the creek, with the velocity of an arrow, and never failed to launch several feet upon the first mass of ice that it encountered.

While we scoured the sea, around the broken floe with the ship, and while the ice was attempted in vain by the boats, the whale continued to press forward in an easterly direction towards the sea. At length, when fourteen lines (about 1680 fathoms) were drawn from the fourth fast-boat, a slight entan-

gement of the line broke it at the stem. The fish then again made its escape, taking along with it a boat and twenty-eight lines. The united length of the lines was 6720 yards, or upwards of $3\frac{3}{4}$ English miles; value, with the boat, above 150 pounds sterling.

The obstruction of the sunken boat to the progress of the fish must have been immense; and that of the lines likewise considerable; the weight of the lines alone being 35 hundred weight.

So long as the fourth fast-boat, through the medium of its lines, retained its hold of the fish, we searched the adjoining sea with the ship in vain; but in a short time after the line was divided, we got sight of the object of pursuit, at the distance of near two miles to the eastward of the ice and boats, in the open sea. One boat only with lines, and two empty boats, were reserved by the ship. Having, however, fortunately fine weather, and a fresh breeze of wind, we immediately gave chase under all sails; though, it must be confessed, with the insignificant force by us, the distance of the fish, and the rapidity of its flight considered, we had but very small hopes of success. At length, after pursuing it five or six miles, being at least nine miles from the place where it was struck, we came up with it, and it seemed inclined to rest after its extraordinary exertions. The two dismantled or empty boats having been furnished with two lines each, (a very inadequate supply,) they, together with the one in a good state of equipment, now made an attack upon the whale. One of the harpooners made a blunder; the fish saw the boat, took the alarm, and again fled. I now supposed it would be seen no more; nevertheless, we chased nearly a mile in the direction I imagined it had taken, and placed the boats, to the best of my judgment, in the most advantageous situations. In this case we were extremely fortunate. The fish rose near one of the boats and was immediately harpooned. In a few minutes two more harpoons entered its back, and lances were plied against it with vigour and success. Exhausted by its amazing exertions to escape, it yielded itself at length to its fate, received the piercing wounds of the lances without resistance, and finally died without a struggle. Thus terminated with success an attack upon a whale which exhibited the most uncommon determination to escape from its pursuers, seconded by the most amazing strength of any individual whose capture I ever witnessed. After all, it may seem surprising that it was not a particularly large individual; the largest lamina of whalebone only measuring nine feet six inches, while those affording

twelve feet bone are not uncommon.* The quantity of line withdrawn from the different boats engaged in the capture was singularly great. It amounted altogether, to 10,440 yards,† or nearly six English miles. Of these, thirteen new lines were lost, together with the sunken boat, the harpoon connecting them to the fish having dropt out before the whale was killed.

After having taken a large circuit with the ship *Esk* in the open sea in search of whales, we saw two or three individuals when at the distance of about twenty miles from the middle hook of the Foreland.‡ The weather was fine and no ice in sight. A boat was despatched towards one of the fish we saw, which was immediately struck. The men were already considerably fatigued, having been employed immediately before in the arduous operation hereafter to be described, called *making off*; but, of course, proceeded in the boats to the chase of the fast-fish. It made its appearance before they all had left the ship. Three boats then approached it, unluckily at the same moment. Each of them so incommoded the other, that no second harpoon could be struck. The fish then took the alarm and ran off towards the east, at the rate of about four miles per hour; some of the boats gave chase and others took hold of the fast-boat and were towed by it to windward. When two boats, by great exertions on the part of their crews, had got very near the fish, and the harpooners were expecting every moment to be able to strike it, it suddenly shifted its course under water, and in a few minutes

* It has been frequently observed, that whales of this size are the most active of the species; and those of very large growth are, in general, captured with less trouble.

† The following is a correct statement of the quantity of lines withdrawn from each of the fast-boats, viz.

		yards.
From the first fast-boat	13 new lines, (the whole of which, together with the boat, were lost,) harpoon drew,	- - 3120
From the second fast-boat	6½ lines; line broke,	- - 1560
third do.	3½ lines; harpoon drew,	- - 840
fourth do.	14 lines; line broke,	- - 3360
fifth do.	½ line; harpoon drew,	- - 120
sixth do.	2½ lines; do. do.	- - 600
seventh do.	2½ lines; do. do.	- - 600
eighth do.	1 line; do. do.	- - 240

Total in yards 10,440

‡ Charles Island, lying parallel to the west side of Spitzbergen, is usually denominated the Foreland; the middle Hook is a remarkable ridge of mountains near the middle of the Island.

discovered itself in a southerly direction, at least half a mile from any boat. It then completed a circuit round the fast-boat, with the sweep of nearly a mile as a radius, and though followed in its track by the boats, it dived before any of them got near it, and evaded them completely. When it appeared again, it was at least half a mile to windward of any of them, and then continued arduously advancing in the same direction. At various times during the pursuit, the boats, having the most indefatigable crews, reached the fish within ten or fifteen yards, when, apparently aware of their design, it immediately sunk and changed its course, so that it invariably made its next appearance in a quarter where no boats were near.

The most general course of the whale being to windward, it soon withdrew all the boats many miles from the ship, notwithstanding our utmost efforts under a press of sail to keep near them.

After six or seven hours pursuit without success, the sky became overcast, and we were suddenly enveloped for some time in the obscurity of a thick fog. In this interval the boats were all moored to the fast-boat, the men being fearful of being dispersed; but on the disappearing of the fog, the pursuit was recommenced with renewed vigour. Still the harpooners were not able to succeed. They were now convinced of the necessity of using every measure to retard the flight of the fish. For this purpose they slacked out nine lines, a weight in air of 11 cwt., while the crew of the fast-boat endeavoured farther to retard its progress, by holding their oars firmly in the water, as if in the act of backing the boat astern. But this plan did not succeed. They then lashed two or three boats with their sides to the stern of the fast-boat, and these were dragged, broadside first, with little diminished velocity for some time. But the fish at length feeling the impediment, suddenly changed its course, and again disappointed the people in two of the boats which had got extremely near it.

Several times the harpooners seized their weapons and were on the point of launching them at the fish, when in an instant it shot from them with singular velocity and disappeared. In this way the chase was continued for fourteen hours, when the fish again turned to leeward. But the men, exhausted by such continued exertion, together with the hard labour to which they had been previously subjected, at the same time being without meat or drink, and sparingly sheltered from the inclemency of the weather by clothes drenched in oil, were incapacitated from taking advantage of the only chance they had ever had of success from the beginning of the chase.

By this time we had reached the boats with the ship. The wind had increased to a gale, and a considerable sea had arisen. We had no hope therefore of success. As however we could not possibly recover the lines at this time, stormy as the weather was, we applied a cask as a buoy to support them, and moored an empty boat, having a jack flying in it, to the cask, with the intention of keeping near it during the storm, and with the expectation of recovering our lines, and a faint hope likewise of gaining the fish after the termination of the gale. The boat was then abandoned. We made an attempt to keep near the boat with the ship, but the increasing force of the gale drove us, in spite of every effort, to leeward. On the first cessation we made all sail, and plied towards the boat; succeeded in finding it, recovered boat and line, but lost the whale.

On the 28th of May, 1817, the Royal Bounty of Leith, Captain Drysdale, fell in with a great number of whales in the latitude of $77^{\circ} 25' N.$, and longitude 5° or $6^{\circ} E.$ Neither ice nor land was in sight, nor was there supposed to be either the one or the other within 50 or 60 miles. A brisk breeze of wind prevailed, and the weather was clear. The boats were therefore manned and sent in pursuit. After a chase of about five hours, the harpooner commanding a boat, who, with another in company, had rowed out of sight of the ship, struck one of the whales. This was about 4 A. M. of the 29th. The captain supposing, from the long absence of the two most distant boats, that a fish had been struck, directed the course of the ship towards the place where he had last seen them, and about 8 A. M. he got sight of a boat which displayed the signal for being fast. Some time afterward he observed the other boat approach the fish, a second harpoon struck, and the usual signal displayed. As, however, the fish dragged the two boats away with considerable speed, it was mid-day before any assistance could reach them. Two more harpoons were then struck, but such was the vigour of the whale, that although it constantly dragged through the water from four to six boats, together with 1600 fathoms of line, which it had drawn out of the different boats, yet it pursued its flight nearly as fast as a boat could row; and such was the terror that it manifested on the approach of its enemies, that whenever a boat passed beyond its tail, it invariably dived. All their endeavours to lance it were therefore in vain. The crews of the loose boats, being unable to keep pace with the fish, caught hold of and moored themselves to the fast-boats, and for some hours afterward *all hands* were constrained to sit in idle impatience, waiting for some relaxation in the speed of

the whale. Its most general course had hitherto been to windward, but a favourable change taking place, enabled the ship, which had previously been at a great distance, to join the boats at 8 P. M. They succeeded in taking one of the lines to the ship, which was made fast to the ship, with a view of retarding its flight. They then furled the top-gallant-sails, and lowered the top-sails; but after supporting the ship a few minutes head to wind, the wither of the harpoon *upset*, or twisted aside, and the instrument was disengaged from its grasp. The whale immediately set off to windward, with increased speed, and it required an interval of three hours before the ship could again approach it. Another line was then taken on board, which immediately broke. A fifth harpoon had previously been struck, to replace the one which was pulled out, but the line attached to it was soon afterward cut. They then instituted various schemes for arresting the speed of the fish, which occupied their close attention nearly twelve hours. But its velocity was yet such, that the master, who had himself proceeded to the attack, was unable to approach sufficiently near to strike a harpoon. After a long chase, however, he succeeded in getting hold of one of the lines which the fish dragged after it, and of fastening another line to it. The fish then fortunately turned towards the ship, which was at a considerable distance to leeward. At 4 P. M. of the 30th, 36 hours after the fish was struck, the ship again joined the boats; when, by a successful manœuvre, they secured two of the fast-lines on board. The wind blowing a moderately brisk breeze, the top-gallant sails were taken in, the courses hauled up, and the top-sails clewed down; but notwithstanding the resistance a ship thus situated must necessarily offer, she was towed by the fish directly to windward, with the velocity of at least one and a half to two knots, during an hour and a half. And then, though the whale must have been greatly exhausted, it beat the water with its fins and tail in so tremendous a way, that the sea around was in a continual foam, and the most hardy of the sailors scarcely dared to approach it. At length, about 8 P. M. after 40 hours of almost incessant, and for the most part fruitless exertions, this formidable and astonishingly vigorous animal was killed. The capture and the flensing occupied 48 hours. The fish was 11 feet bone (the length of the longest laminæ of whale bone); and its produce filled 47 butts, or $23\frac{1}{2}$ ton casks with blubber.*

* This interesting occurrence was communicated to me by the late

Excepting when it has young under its protection, the whale generally exhibits remarkable timidity of character. A bird perching on its back alarms it. The fisher, however, is sometimes liable to danger from its fury.

The *Aimwell*, while cruising in the Greenland seas, in the year 1810, had boats in chase of whales. One of them was harpooned. But instead of sinking immediately, on receiving the wound, as is the most usual manner of the whale, this individual only dived for a moment, and then rose again beneath the boat, struck it in the most vicious manner with its fins and tail, stove it, upset it, and then disappeared. The crew, seven in number, got on the bottom of the boat, but the unequal action of the line, which for some time remained entangled with the boat, rolled it occasionally over, and thus plunged the crew repeatedly into the water. Four of them, after each immersion, recovered themselves, and clung to the boat; but the other three, one of whom was the only person acquainted with the art of swimming, were drowned before assistance could arrive. The four men in the boat being rescued, the attack was renewed, and two more harpoons struck. But the whale, irritated instead of being enervated by its wounds, recommenced its furious conduct. The sea was in a foam. Its tail and fins were in awful play; and in a short time, harpoon after harpoon drew out; the fish was loosened from its entanglement and escaped.

On the 3rd of June 1811, a boat from the *Resolution*, commanded at that time by myself, put off in pursuit of a whale, and was rowed upon its back. At the moment that it was harpooned, it struck the side of the boat a violent blow with its tail, the shock of which threw the boat steerer to some distance into the water. A repetition of the blow projected the harpooner and line manager in a similar way. One of the men regained the boat, but as the fish immediately sunk, and drew the boat away from the place, his two companions in misfortune were soon left far beyond the reach of assistance. The harpooner, though a practised swimmer, felt himself so bruised by a blow he had received on the chest, that he was totally incapacitated from giving the least support to his fellow sufferer. The ship being happily near, a boat arrived to their succour, at the moment when the line manager, who was unacquainted with the art of swimming, was on the point of sinking to rise no more. The fish, after a close pursuit, was subdued.

Captain of the *Royal Bounty*, in a letter containing the account of the transaction, as inserted in his log book.

A large whale, harpooned from a boat belonging to the same ship, became the subject of a general chase. Being myself in the first boat which approached the fish, I struck my harpoon at arm's length, by which we fortunately evaded a blow which appeared to be aimed at the boat. Another boat then advanced, and another harpoon was struck, but not with the same result, for the stroke was returned by a tremendous blow from the fish's tail. The boat was sunk by the shock, and at the same time whirled round with such velocity, that the boat steerer was precipitated into the water, on the side next the fish, and was accidentally carried down to a considerable depth by its tail. After a minute or two he arose, and was taken up along with his companions into my boat. A similar attack was made on the next boat which came up; but the harpooner, being warned of the prior conduct of the fish, used such precaution, that the blow, though equal in strength, took effect only in an inferior degree. The activity and skill of the lancers soon overcame this designing whale, and added its produce to the cargo of the ship. Such intentional mischief on the part of the whale, it must be observed, is a somewhat rare occurrence.

Proceedings after a Whale is killed.

Before a whale can be flensed, as the operation of taking off the fat and whalebone is called, some preliminary measures are requisite. These consist in securing the fish to a boat, cutting away the attached whale-lines, lashing the fins of the whale together, and towing it to the ship.

The first operation performed on a dead whale is to secure it to a boat. This is easily effected by lashing it with a rope, passed several times through two holes pierced in the tail, to the boat's bow. The more difficult operation of freeing the whale from the entanglement of the lines is then attempted. As the whale, when dead, always lies on its back, or on its side, the lines and harpoon are generally far under water. When they are seen passing obliquely downward, they are hooked with a grapnel, pulled to the surface and cut. But when they hang perpendicularly, or when they cannot be seen, they are discovered by a process called "sweeping a fish."

While this is in progress, the men of the other boats, having first lashed the tail to a boat, are employed in lashing the fins together across the belly of the whale. I have observed two or three curious circumstances connected with these operations, which I shall venture to mention.

On one occasion, I was myself engaged in the capture of a

fish, upon which, when to appearance dead, I leaped, cut holes in the fins, and was in the act of reeving a rope through them, when the fish sunk beneath my feet. As soon as I observed that the water had risen above my knees, I made a spring towards a boat at the distance of three or four yards from me, and caught hold of the gunwhale. Scarcely was I on board before the fish began to move forward, turned from its back upon its belly, reared its tail aloft and began to shake it with such prodigious violence, that it resounded through the air to the distance of two or three miles. After two or three minutes of this violent exercise, it ceased, rolled over upon its side, and died.

In the year 1816, a fish was to all appearance killed. The fins were partly lashed, and the tail on the point of being secured, and all the lines excepting one were cut away, the fish meanwhile lying as if dead. To the astonishment and alarm, however, of the sailors, it revived, began to move, and pressed forward in a convulsive agitation; soon after, it sunk in the water to some depth and then died. One line remained attached to it, by which it was drawn up and secured. A fish being properly secured, is then "taken in tow," that is, all the boats join themselves in a line, by ropes always carried for the purpose, and unite their efforts in rowing towards the ship. The course of the ship, in the mean time, is directed towards the boats, but in calms, or when the ship is moored to the ice, at no great distance, or when the situation of the fish is inconvenient or inaccessible, the ship awaits the approach of the fish.

The fish having reached the ship is taken to the *larboard* side, arranged and secured for flensing. For the performance of this operation a variety of knives and other instruments is requisite.

Towards the stern of the ship, the head of the fish is directed; and the tail, which is first cut off, sent abreast of the fore chains. The smallest or posterior part of the whale's body, where the tail is united, is called the rump, and the extremity or anterior part of the head is drawn in an opposite direction by means of the nose tackles. Hence, the body of the fish is forcibly extended. The right-side fin, being next the ship, is lashed upward towards the gunnel. A band of blubber, two or three feet in width, encircling a fish's body, and lying between the fins and the head, being the fat of the neck, or what corresponds to the neck in other animals, is called the *kent*, because by means of it the fish is turned over or *kented*. In the commencement of this band of fat or kent is fixed the lower extremity of a combination of powerful

blocks, called the *kent purchase*. Its upper extremity is fixed round the head of the main mast, and its *fall* or rope is applied to the windlass, drawn tight, and the upper surface of the fish rising several inches above the water. The enormous weight of a whale prevents the possibility of raising it more than one fourth, or one fifth part out of the water, except, indeed, when it has been some days dead, in which case it swells in consequence of air generated by putrefaction, until one third of its bulk appears above the surface; the fish then lying belly upwards, extended and well secured, is ready for the operation of flensing.

Process of Flensing.

After the whale is properly secured along side of the ship, the harpooners, having their feet armed with spurs, to prevent them from slipping, descend upon the fish. Two boats, each of which is under the guidance of one or two boys, attend upon them, and serve to hold all their knives, and other apparatus. Thus provided, the harpooners, directed by the specksioner,* divide the fat into oblong pieces, or "slips," by means of "blubber spades" and "blubber knives;" then affixing a "speck-tackle" to each slip, flay it progressively off, as it is drawn upwards. The speck-tackles, which are two or three in number, are rendered effective by capstern winches, or other mechanical powers. The flensers commence with the belly and under jaw, being the only part then above water. The blubber, in pieces of half a ton each, is received on deck, and divided into portable, cubical, or oblong pieces, containing near a solid foot of fat, and passed down between decks, when it is packed in a receptacle provided for it in the hold, or other suitable place, called the flens-gut, where it remains until further convenience.

All the fat being taken away from the belly, and the right fin removed, the fish is then turned round on its side by means of the kent, which, by the power of the windlass, readily performs this office. The upper surface of fat is again removed, together with the left fin, and after a second kenting, one of the "lips" is taken away, by which the whalebone of one side of the head, now lying nearly horizontal, is exposed. The fish being a little further turned, the whalebone of the left side is dislodged by the use of "bone hand-

* The name of this officer was introduced by the Dutch, and is derived from the word *speck*, which, in their language, is applied to the fat of the whale, as well as to that of other animals.

spikes," "bone knives," and "bone spades." These constitute what are called "bone geer," and are used, with the assistance of speck-tackles, for taking up the whalebone in one mass. On its arrival on deck it is split with bone wedges into "junks, containing five to ten blades each, and stowed away. A further kenting brings the fish's back upward, and the next exposes the second side of bone. As the fish is turned round, every part of the blubber becomes successively uppermost and is removed. At length, when the whole of the blubber, whalebone, and jaw bones have been taken on board, the kent, which now appears a slip of perhaps 30 feet in length, is also separated, together with the rump rope, and nose tackle, on which the carcass, being at liberty, generally sinks in the water and disappears.

When sharks are present, they generally help themselves very plentifully during the progress of the flensing; but they often pay for their temerity with their lives. Fulmars pay close attendance in immense numbers. They seize the fragments occasionally disengaged by the knife, while they are swimming in the water; but most of the other gulls, who attend on the occasion, take their share on the wing. The burgomaster is decidedly master of the feast. Hence every bird is obliged to relinquish the most delicious morsel, when the burgomaster descends to claim it.

When despatch is seconded by ability, the operation of flensing can be performed on a whale, affording 20 or 30 tons of blubber, in the space of three or four hours. Flensing in a swell is a most difficult and dangerous undertaking, and when the swell is considerable, it is commonly impracticable. No ropes or blocks are capable of bearing the jerk of the sea. The harpooners are annoyed by the surge, and repeatedly drenched in water, and are likewise subject to be wounded by the breaking of ropes, or hooks, or tackles, and even by strokes from each other's knives. Hence, accidents in this kind of flensing are not uncommon. The harpooners not unfrequently fall into the fish's mouth, when it is exposed by the removal of a surface of blubber; where they might easily be drowned, but for prompt assistance.

Some years ago I was witness of a circumstance in which a harpooner was exposed to the most imminent risk of his life at the conclusion of a flensing process, by a very curious accident. The harpooner stood on one of the jaw bones of the fish, with a boat by his side. In this situation, while he was in the act of cutting the kreng* adrift, a boy inadvertently

* The carcass, after being flensed, is so called.

stuck the point of the boat-hook, by which he usually held the boat, through the ring of the harpooner's spur, and in the same act seized the jaw bone of the fish with the hook of the same instrument. Before this was discovered the kreng was set at liberty, and began instantly to sink. The harpooner then threw himself towards the boat, but being firmly entangled by the foot, he fell into the water. Providentially he caught the gunwhale of the boat with both hands; but overpowered by the force of the sinking kreng, he was on the point of relinquishing his grasp, when some of his companions got hold of his hands while others threw a rope round his body. The carcass of the fish was now suspended entirely by his body, which was consequently so dreadfully extended, that there was some danger of his being drawn asunder. But such was his terror of being taken under water, that notwithstanding the excruciating pain he suffered, he constantly cried to his companions to "haul away the rope." He remained in this dreadful state until means were adapted for hooking the kreng with a grapnel, and drawing it back to the surface of the water.

Process of Making Off.

When a fish is caught, or sometimes when there is a good prospect of success in the fishery, even before a fish is caught, the centre of the ship's hold is disencumbered of a few of its casks, to be in readiness for the reception of the blubber. The cavity thus made, together with all the space between decks which can conveniently be appropriated to the same purpose, receives the name of the *flens-gut*. Now, when the flens-gut is filled with blubber, or when no fish having been seen, a favourable opportunity of leisure is presented, the operation of *making off** is generally commenced. This consists of freeing the fat from all extraneous substances, especially the muscular parts, and the skin; then cutting it into small pieces, and putting it into casks through the bunnghole. Before the process of making off can, however, be commenced, several preparatory measures are necessary. The ship must be moored to a convenient piece of ice, or placed in an open situation, and the sails so reduced as to require no further attention in the event of bad weather occurring. The hold of the ship must be cleared of its superstructure of casks, until the

* The expression "making off" seems to be derived from the word *afmaaken* of the Dutch, signifying to finish, adjust, or complete, referring to the nature of the operation, as a concluding, finishing, or adjusting process.

"ground tier," or lowest stratum of casks, is exposed; and the ballast water must be "started," or pumped out of all the casks that are removed upon deck, as well as out of those in the ground tier, which are first prepared for the reception of the blubber. In "breaking out the hold," it is not necessary to lay open more of the ground tier at a time than three or four casks extended in length.

The water which is discharged from the casks in the hold, provided they have been before in use, gives out a great quantity of a strong disagreeable vapour, consisting probably of sulphuretted and phosphuretted hydrogen, with a mixture of other gaseous fluids, produced by the decomposition of the oleaginous and other animal substances left in the casks after former voyages. This decomposition seems to be encouraged, if not wholly produced, by the action of the water on the animal matter; because the same casks, if bunged close, when empty, give out but a small quantity of gas, and that of inferior pungency. The gas proceeding from oily casks having contained water, resembles, in some degree, though vastly more pungent, the gas evolved by "bilge water," or the stagnant water which rests among the timbers of a very tight ship. The gas discharged from oily casks is usually stronger and more abundant, in proportion as the water from which it is disengaged has been a longer time in the casks. A considerable quantity of it is generated in the space of three or four months. This gas blackens metals, even gold, restores some metallic oxides, is disagreeable in respiration, and affects the eyes of the persons employed in the hold, where it is most abundant, so as to occasion ophthalmic inflammation, and frequently temporary blindness.

While the line-managers, together with the "skeeman,"* the cooper, and perhaps a few others are employed in breaking out of the hold, the rest of the crew on the deck arrange all the variety of apparatus used for the preparation of the blubber, before it is put into the casks. Of this apparatus, the most considerable part is the "speck-trough," with its appendages. It consists of a kind of oblong box or chest, about twelve feet in length, $1\frac{3}{4}$ feet in breadth, and $1\frac{1}{2}$ feet in depth. The speck-trough is fixed upon the deck as nearly as possible over the place where the casks are to be filled in the hole. A square hole, made in its bottom, is placed either over the nearest hatch-way to the scene of operation, or upon a corresponding hole cut in the deck.

* The officer who has the direction of operations conducting in the hold.

The speck-trough is then secured, and its lid turned backward into a horizontal position; in which position it is supported on one side by its hinges, and on the other by screw props or pillars; or it is altogether rested upon several little stools. The surface of the lid, which, thus placed, forms a level table, is then covered with blocks of whales' tail, from end to end.—This substance, from its sinewy and elastic nature, makes excellent "chopping blocks," and preserves the "chopping knives" from injury, when used for dividing the blubber upon it. Into the square hole in the bottom of the speck-trough is fitted an iron-frame, to which is suspended a canvass tube or "hose," denominated a *lull*. The lull is open at both ends.—Its diameter is about a foot, and its length sufficient to reach from the deck to the bottom of the hold. To the middle, or towards the upper part of the lull, is attached a "pair of nippers," consisting of two sticks fastened together by a kind of hinge at one end, and capable of being pressed together at the other. The nippers being passed across the body of the lull, and their detached extremities brought together, they embrace it so closely, that nothing can pass downward while they remain in this position; but when, on the other hand, the nippers are extended, the lull forms a free channel of communication between the speck-trough and the hold.

Every thing being now in readiness, the blubber, as it is thrown out of the flens-gut, undergoes the following several operations. It is received upon deck by the "krengers," whose office is to remove all the muscular parts, together with such spongy or fibrous fat as is known by experience to produce very little oil. When these substances, which go under the general denomination of *kreng*, are included among the blubber in the casks, they undergo a kind of fermentation, and generate such a quantity of gas, as sometimes to burst the containing vessels, and occasion the loss of their contents.—From the krengers, the blubber passes to the harpooners. Each of these officers, provided with a blubber-knife, or a strand knife, places himself by the side of a "cosh," which is an upright fixed in the deck, from the top whereof project several sharp spikes. An attendant, by means of a pair of "hand hooks," or a "pick haak," then mounts a piece of blubber upon the spikes of the cosh, and the harpooner slices off the skin. From the skimmers the blubber is passed into an open space called the bank, prepared as a depository, in front of the speck-trough, and it is then laid upon the "chopping blocks" as wanted. It now falls under the hands of the boat steerers, who, armed with "chopping knives," are arranged in a line by the side of the chopping blocks, with the speck-

trough before them. Thus prepared, they divide the blubber, as it is placed on their blocks, into oblong pieces, not exceeding four inches in diameter, and push it into the speck-trough intended for its reception. And, finally, the blubber falls under the direction of the line managers stationed in the hold, who receives it into tubs, through the medium of the lull; and pass it, without any instrument but their hands, into the casks through their bung-holes. The casks being closely filled, are then securely bunged up.

When the ground tier casks, as far as they have been exposed, are filled, the second tier of casks is "stowed" upon it, and likewise filled with blubber, together with the third tier casks when necessary. As in this progressive manner, when fish can be had in sufficiency, all the hold is filled, and likewise the space between decks,—it is evident that the process of making-off must be tedious, disagreeable and laborious. Fifty men, actively employed, can prepare and pack about three tons of blubber in an hour; though, more frequently, they are contented with making-off little more than half that quantity.*

When a ship, which makes a successful fishing, is deficient in casks, the remaining vacancies adapted for the reception of the cargo, are filled with "blubber in bulk," that is, the blubber in large pieces as it is taken off the whales, is laid skin downward, upon the highest tier of casks, and over this, stratum after stratum until the vacancies are filled. A little salt is usually scattered over the surface of each stratum of blubber, which assists in preserving the animal fibre, and in preventing the discharge of the oil. Blubber in bulk, notwithstanding every precaution, however, generally loses much of its oil.

A quick passage homeward, with cool weather and smooth sea, are favourable for its preservation, but under the influence of opposite circumstances, it becomes greatly reduced.

Process of boiling Blubber, or extracting Oil.

The blubber, which is originally in a state of firm fat, is found, on arrival in a warm climate, to be in a great measure resolved into oil. The casks containing the blubber are conveyed by a mechanical apparatus to the top of a wooden cis-

* The operation of making-off was always, in the earlier ages of the fishery, performed on shore; and even so recently as the middle of last century, it was customary for ships to proceed into a harbour, and there remain so long as this process was going on.

tern, called the *starting-back*, capable of containing from 3 to 6 or 10 tons, into which their contents are started through the bung-holes. When the copper or boiler, which is a vessel of about the same capacity as the starting-back, is properly cleansed, the contents of the starting-back, on lifting a clough at the extremity, or turning a stop-cock, fall directly into the copper, one edge of which is usually placed beneath. The copper is filled within two or three inches of the top, a little space being requisite to admit of the expansion of the oil when heated; and then a brisk fire is applied to the furnace, and continues until the oil begins to boil. This usually takes place in less than two hours. Many of the fritters or fenks (the refuse) float on the surface of the oil before it is heated, but after it is boiled off, the whole, or nearly so, subside to the bottom. From the time the copper begins to warm, until it is boiled off, or ceases to boil, its contents must be incessantly stirred by means of a pole armed with a kind of broad blunt chisel, to prevent the fenks from adhering to the bottom or sides of the vessel. When once the contents of the copper boil, the fire in the furnace is immediately reduced and shortly afterward altogether withdrawn. Some persons allow the copper to boil an hour, others during two or three hours. The former practice is supposed to produce finer or paler oil, the latter a greater quantity. Supposing the copper to be filled at four in the morning, it is generally brought to boil by half-past five, and boiled off at half-past six or seven. It then stands to cool or subside until about two in the afternoon, when the bailing process commences. A back or cooler having been prepared, for the reception of the oil, by putting into it a quantity of water,* for the double purpose of preventing the heat of the oil from warping or rending the back, and for receiving any impurities which it may happen to hold in suspension; a wooden spout, with a large square box-like head, which head is filled with brushwood or broom, that it may act as a filter, is then placed along, from the "copper-head"† to the cooler so as to form a communication between the two. The oil in the copper being now separated from the fenks, water, and other impurities, all of which have subsided to the bottom, is, in a great measure run off through the pipe communicating with the cooler, and the remainder is carefully lifted in copper or tin ladles, and poured upon the broom in the spout, from

* Some persons dispense with the water, believing that it promotes rancidity in the oil.

† The platform built around the edge of the copper is called the *copper-head*.

whence it runs into the same cooler, or any other cooler, at the pleasure of the "boilers."* Besides oil and fenks, the blubber of the whale likewise affords a considerable quantity of watery liquor, produced probably from the putrescence of the blood, on the surface of which some of the fenks, and all the greasy animal matter called *footje* or *footing*, float, and upon the top of these the oil. Great care therefore is requisite on approaching these impure substances, to take the oil off by means of shallow tinned iron or copper ladles, called *skimmers*, without disturbing the refuse, and mixing it with the oil. There must always, however, be a small quantity towards the conclusion, which is a mixture of oil and footing; such is put into casks or other suitable vessels by itself, and when the grossy part has thoroughly subsided, the most pure part is skimmed off, and becomes fine oil, and the impure is allowed to accumulate by itself in another vessel, where in the end it affords "brown oil."

The refuse now left in the copper is *bailed* into a tunnel or spout, which conveys it into the fenkback, where it remains as long as the capacity of the vessel will admit; a portion of brown oil, which is constantly found rising to the surface, being in the mean time occasionally skimmed off.

A few years ago my father instituted a process for reducing blubber into oil, by the use of steam; and a similar process has been adopted in Hull, and other ports, and applied to the extraction of oil, with considerable advantage.

From a ton, or 252 gallons by measure, of blubber, there generally arises from 50 to 65 gallons of refuse, whereof the greater part is a watery fluid. The constant presence of this fluid, which boils at a much lower temperature than the oil, prevents the oil itself from boiling, which is probably an advantage, since, in the event of the oil being boiled, some of the finest and most inflammable part would fly off in the form of vapour; whereas the principal part of the steam which now escapes, is produced from the water.

Some persons make a practice of adding a quantity of water, amounting, perhaps, to half a ton, to the contents of each copper, with the view of weakening or attenuating the viscid impurities contained in the blubber, and thus obtaining a finer oil; others considered the quantity of watery fluid already in the blubber as sufficient for producing every needful effect.

Each day, immediately after the copper is emptied, and while it is yet hot, the men employed in the manufacture of

* The men employed in extracting oil are thus denominated.
VOL. II.

the oil, having their feet defended by strong leathern or wooden shoes, descend into it, and scour it out with sand and water, until they restore the natural surface of the copper, wherever it is discoloured. This serves to preserve the oil from becoming high coloured,* which will always be the case, when proper cleanliness is not observed.

The starting-back being previously filled with blubber, its contents are again transferred into the copper, and the fire is applied as before. This is generally accomplished by four, or half past four o'clock in the afternoon. The copper again boils by half an hour after five or six, and is boiled off by seven or eight in the evening. The men employed in this service, consisting of about six persons, alternately watch in the night by couples. Those on watch commence about two in the morning to empty the copper, which done, they again fill it from the starting-back, which is always made ready the night before. Thus the process goes on, until the whole cargo is finished.

By means of three coolers, severally capable of containing at least twice the quantity of oil produced from one boiling of blubber in the copper, each can be allowed, in turn, to stand undisturbed upwards of twenty-four hours. Thus, while one is in the act of being filled, the other stands to cool and settle, and the third is drawn off. If the backs be twice this size, or four times the capacity of the copper, every one will require two days to be filled by one copper, and after being filled, may subside during two or three days undisturbed. Even two backs in number, of this capacity, would admit of an interval of twenty-four hours each, after being filled, before it would be necessary to begin to empty it. Thus prepared and cooled, the oil is in a marketable state, and requires only to be transferred from the coolers into casks for convenience of conveyance to any part of the country. Each of the coolers, it has been observed, is furnished with a stop-cock, beneath which there is a platform adapted for receiving the casks, when they are filled, with great ease by the introduction of a leather tube, extending from the orifice of the stop-cock into the bung-hole.

At the conclusion of the process of boiling, each vessel's cargo manufactured on the premises, the backs are completely emptied of their contents. To effect this, water is poured in, until the lower part of the stratum of oil rises to within a few

* The palest coloured oil is most esteemed by buyers, and is supposed to be the best; simply, perhaps, because it seems to have been manufactured with care, and appears to be free from any admixture of brown or black oil, produced from the fenk-back, or found in the hold of the ship.

lines of the level of the stop-cock, and permits the greater part of the oil to escape. The quantity left amounts, perhaps, to half an inch, or an inch in depth. To recover this oil without waste requires a little address. A deal-board, in length a little exceeding the breadth of the cooler, is introduced at one end, a little diagonally, and placed edgewise in its contents. The ends of the board being covered with flannel, when pressed forcibly against the two opposite sides of the cooler, prevent the oil from circulating past. The board is then advanced slowly forward, towards the part of the back, where the stop-cock is placed; and in its progress, (the ends being kept close to the side of the cooler, and the upper edge a little above the surface of the oil,) all the oil is now collected by the board, while the water has a free circulation beneath it. When the oil accumulates to the depth of the board, its further motion is suspended, until the oil, thus collected, is drawn off. Another similar board is afterward introduced at the farthest extremity of the cooler, and passed forward in the same manner, whereby the little oil which escapes the first is collected. Now the remnant, which still refuses to run off by the orifice of the stop-cock, being collected in a corner, is taken up by *skimmers*; and the footing or sediment which appears at the last, is disposed of in the same way as the footing from the copper, until the oil it contains rises to the surface and can be removed.

In most of the out-ports, the oil is generally deposited in casks, in which it remains until it is disposed of by the importers. In London, however, and in some concerns in Hull and other ports, the speculators in the whale-fishery are provided with cisterns or tanks, wherein they can deposit their oil, and preserve it until a convenient time for selling, without being subject to the waste which usually takes place when it is put into casks. From these cisterns any quantity can be drawn off at pleasure.

The smell of oil during its extraction, is undoubtedly disagreeable; but perhaps not more so than the vapour arising from any other substance submitted to the action of heat when in a putrid state. The prevailing opinion, however, that a whale ship must always give out the same unpleasant smell is quite erroneous. The fact is, that the fat of the whale in its fresh state has no offensive flavour whatever, and never becomes disagreeable until it is brought into a warm climate and becomes putrid; neither is a whale ship more unpleasant than any other trader, until after her cargo is opened on her arrival in port.

Description of Whalebone, and the Method of Preparing it.

Whalebone or whale-fins, as the substance is sometimes though incorrectly named, is found in the mouth of the common Greenland whale, to which it serves as a substitute for teeth. It forms an apparatus most admirably adapted as a filter, for separating the minute animals on which the whale feeds, from the sea water in which they exist.

It is a substance of a horny appearance and consistence, extremely flexible and elastic, generally of a bluish black colour, but not unfrequently striped longitudinally with white, and exhibiting a beautiful play of colour on the surface. Internally it is of a fibrous texture, resembling hair; and the external surface consists of a smooth enamel capable of receiving a good polish.

This substance, when taken from the whale, consists of laminæ, connected by what is called the gum, in a parallel series, and ranged along each side of the mouth of the animal. The laminæ are about 300 in number, in each side of the head. The length of the longest blade, which occurs near the middle of the series, is the criterion fixed on by the fishers for designating the size of the fish. Its greatest length is about 15 feet; but an instance very rarely occurs of any being met with above $12\frac{1}{2}$ or 13 feet. Its greatest breadth, which is at the root end, is 10 or 12 inches, and its greatest thickness four-tenths or five-tenths of an inch.

The two *sides* or series of the whalebone are connected at the upper part of the head, or crown bone of the fish, within a few inches of each other, from whence they hang downward, diverging so far as to enclose the tongue between their extremities; the position of the blades, with regard to each other, resembles a frame of saws in a saw mill; and taken altogether, they exhibit in some measure the form and position of the roof of a house. The smaller extremity and interior edge of each blade of bone, or the edge annexed to the tongue, are covered with a long fringe of hair, consisting of a similar kind of substance as that constituting the exterior of the bone. Whalebone is generally brought from Greenland in the same state as when taken from the fish, after being divided into portable *junks* or pieces, comprising ten or twelve laminæ in each; but occasionally it is subdivided into separate blades, and the gum and hair removed when at sea.

One of the first importations of whalebone into England was probably in the year 1594, when a quantity of this substance, being part of the cargo of a wrecked Biscayan ship,

was picked up at Cape Breton, by some English ships fitted out for the whale and morse fisheries, after the example of the Icelanders and Biscayans.*

This substance has been held in such high estimation, that since the establishment of the Spitzbergen whale-fishery, the British have occasionally purchased it of the Dutch at the rate of 700*l.* per ton.† It is calculated that at least 100,000*l.* *per annum* were paid to the Dutch for this article about the year 1715 to 1721, when the price was 400*l.*‡ About the year 1763 the price in England was 500*l.* *per ton*; but after an extensive importation of this article from New England, the price declined to 350*l.*§ and subsequently as low as 50*l.* *per ton*. Of late years the price has usually been fluctuating between 50*l.* and 150*l.* *per ton*. Whalebone becomes more valuable as it increases in length and thickness.

On or near the premises where the oil is extracted, the whalebone is commonly cleaned and prepared.

The first operation, if not already done, consists in depriving it of the gum. It is then put into a cistern containing water, until the dirt upon its surface becomes soft. When this effect is sufficiently produced, it is taken out piece by piece, laid on a plank placed on the ground, where the operator stands, and scrubbed or scoured with sand and water, by means of a broom or a piece of cloth. It is then passed to another person, who, on a plank or bench elevated to a convenient height, scrapes the root end where the gum was attached, until he produces a smooth surface; he or another workman then applies a knife or a pair of shears to the edge and completely detaches all the fringe of hair connected with it. Another person, who is generally the superintendent of the concern, afterward receives it, washes it in a vessel of clean water, and removes with a bit of wood the impurities out of the cavity of the root. Thus cleansed, it is exposed to the air and sun until thoroughly dry, when it is removed into a warehouse, or other place of safety and shelter.

Before it is offered for sale, it is usually scrubbed with brushes and hair-cloth, by which the surface receives a polish, and all dirt or dust adhering to it is removed; and finally, it is packed in portable bundles, consisting of about a hundred weight each. The *size-bone*, or such pieces as measure six

* Hakluyt's *Voyages*, vol. iii. p. 194.

† Macpherson's *Annals of Commerce*, vol. iii. p. 512.

‡ Elking's *View of the Greenland Trade*, &c. p. 65.

§ Macpherson's *Annals*, vol. iii. p. p. 371.

WHALE-FISHERY.

ward in length, is kept separate from the *under-size*; being usually sold at half the price of the former. A blade being terminated with a quantity of hair, there is a difficulty in deciding, whether some blades of one are size or not. Owing to the diminished value of the bone, and more particularly, in consequence of the premium on every size-fish, it becomes a matter of importance in a doubtful case, to decide this point. A decision, which I understand has been made in a court of law, is now a generally received rule, that so much of the substance terminating each blade, as gives rise to two or three hairs, is whalebone: though, in fact, the hair itself is the same substance as that of which the whalebone is composed.

APPENDIX.

A.

The Common Wild Cat ; or Bay Lynx.

Felis Rufa, Guld. Penn. &c.

(See vol. 1. plate opposite page 302, fig. 2.)

It is highly probable that all the species of wild cat described under the names of *Fasciata*, *aurea*, *Montana*, &c., may be correctly referred to the present, which is the only species, (in addition to the *Felis Canadensis*, Geoff. ; *Borealis*, Temm. ; of whose existence in this country, sufficiently satisfactory evidence is to be obtained. At least we have not been able to find any other in the cabinets of natural history to which we have had access, nor in the caravans of living American animals, frequently exhibited within our vicinity. The naturalists attached to the different exploring parties, which have traversed vast extents of the American territory, have not been able, by their own efforts, nor through the aid of the Indians, to procure any species but the common wild cat : we therefore deem it most correct to wait for additional observations, before we admit the existence of so many species as have been proposed.

The common wild cat stands very high upon its legs, and has a short tail, which is curved upwards at its extremity ; which circumstances tend to give the animal an appearance of being somewhat disproportioned. In other respects, its physiognomy reminds one strongly of the domestic cat, to which its general aspect and movements are very similar. The residence of the wild cat is usually in wooded districts, where it preys upon birds, squirrels, and other small animals, which are taken by surprise, according to the manner of all the animals belonging to the genus *Felis*.

APPENDIX.

common wild cat is about two feet long, and twelve inches in circumference. The tail but little exceeds three inches in length.

The general colour of the pelage, is a deep reddish, and with small spots of blackish brown; the inferior of the body and throat, as well as the inferior surface of the tail are white, or whitish. Numerous small, nearly vertical streaks of black are to be observed on the front beneath the ears, and down to the space surrounding the eyes, which are encircled by a clear pale, red, or whitish line. There are small pencils of hairs to the tips of the

B.

I believe the observation was first made by MITCHILL, that the opossum, *Didelphis Virginiana*, is never found to the north of the Hudson, and we have been informed by a scientific friend who has devoted an espe-





Wistar's Fossil Ox

D.

Wistar's Fossil Elk.

(Vol. 2. fig * and † in plate opposite page 197.)

The late distinguished professor WISTAR published an account of some fossil skulls, (exhumed at Big-Bone Lick, Kentucky, by Gen. Clark, one of the enterprising explorers of the western regions,) which were presented to the American Philosophical Society, by JEFFERSON. Among other descriptions is the following, of the head of one of the largest species of the genus *Cervus*.

The breadth of the skull, at its narrowest part is 4.75 inches. The depth, from the margin of the occipital surface to the most distant part of the great foramen of the occipital bone, is 5.25 inches. From the superior surface, immediately posterior to the base of the horns, to the body of the sphenoid bone, immediately under it, 4.7 inches. The length of the cranium, from the centre of the space between the horns, to the projection of the occipital bone, is 6.37. inches.

Dr. Wistar compared this skull with that of the American Elk, *Cervus Canadensis*, and the Rein-Deer, *C. Taurandus*, and concluded, that it more nearly resembled the Elk, at the occiput, though differing from it greatly in the position and projection of the horns. According to the measurements and comparisons of Dr. Wistar, this Elk must have been much larger than either the American Elk, or the Rein-Deer. The species is doubtless entirely extinct.*

The name of "*Americanus*" has been given to this species.

* See American Philosophical Trans. vol. i. new series, p. 377 In the figures we have transferred from Wistar's plate, the posterior and superior view of the skull is marked with a * ; the profile view with a †.

F.

Wistar's Fossil Ox.

In the paper above referred to, Dr. Wistar described the fossil skull of an ox, obtained from the same locality, which he considered as nearly allied to the *Bison, Bos Americanus*. The most remarkable peculiarity of this skull is the projection or convexity of that portion of the facial or frontal surface between the horns. The accompanying plate gives a front and back view of this skull. The species has been named "*Bombifrons*."

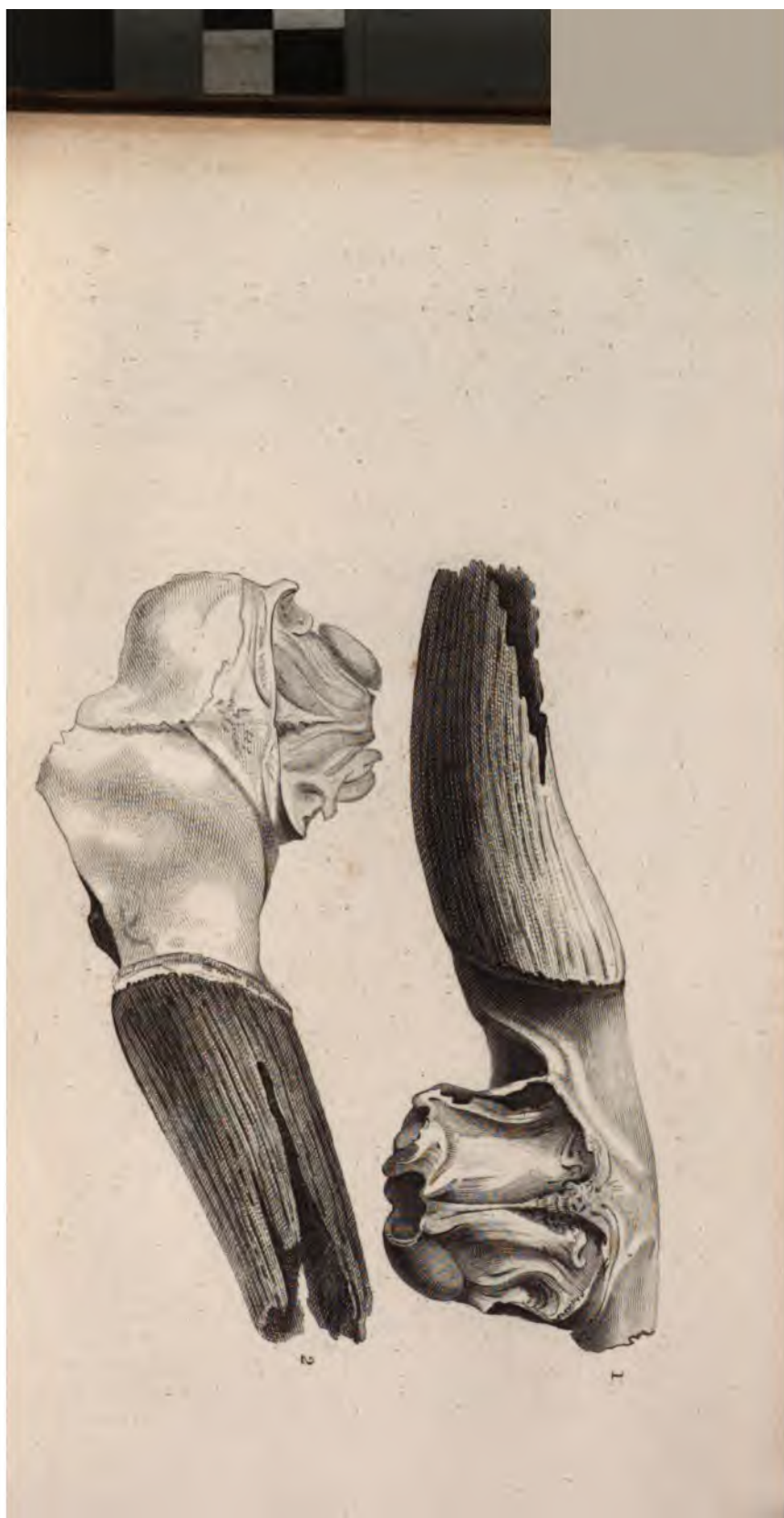
Great Fossil Ox.

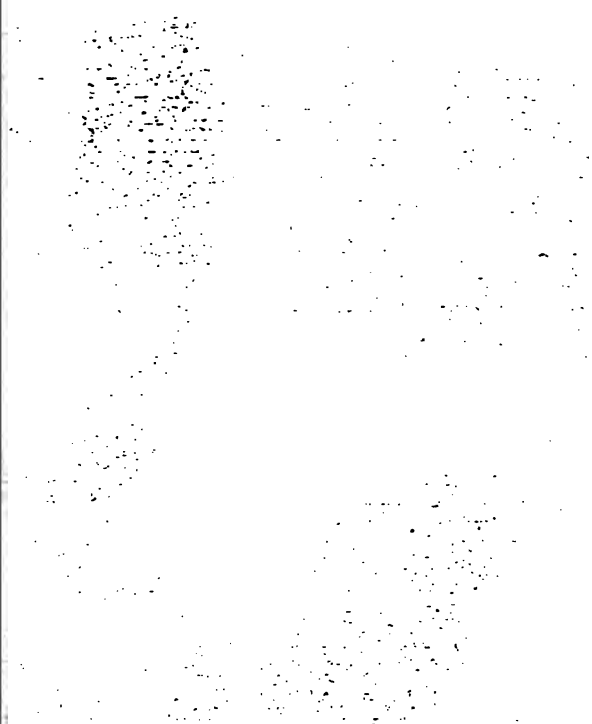
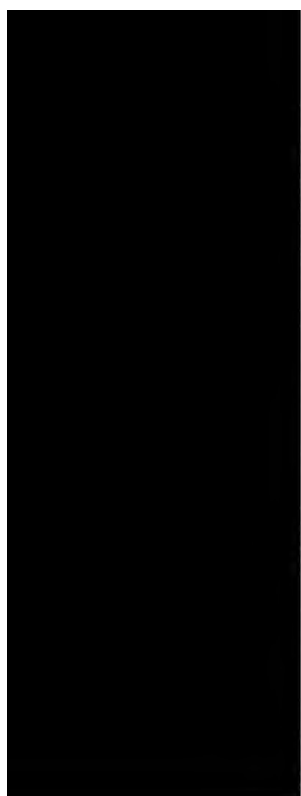
The portion of the skull, and nucleus of the horn, belonging to the valuable cabinet of the American Philosophical Society, from which specimen the annexed accurate drawing was made by M. LE SUEUR, was first described and figured in the *Annals of the Museum*, by Cuvier, and subsequently in his great work on *Fossil Bones*. The drawing renders any detailed description unnecessary. The nucleus of the horn measures twenty-eight inches in circumference. Though nothing but the fragment here represented is preserved, there can be no doubt but that the animal was of great size and belonged to a species which is utterly extinct. The species has been named "*Catifrons*."

Dekay's Fossil Ox.

We must refer the reader to the second volume of the *Annals of the Lyceum of New York* for the full description of the fragments of this skull, and the comparisons instituted by Dr. Dekay to determine the species.

Dr. Dekay considers that none of the Genus *Bos*, now to be found in this country, have crania in the slightest degree resembling this specimen. It was thrown out at the erup-





tion caused by an earthquake in 1812, which entirely destroyed the town of New Madrid, on the Mississippi.

Dr. Dekay proposes to designate the species of Fossil crania, to which he refers those of Pallas and Ozeretskovsky by the name of *Bos Pallasii*, and New Madrid fragments he refers provisionally to the same.

Mitchill's Fossil Walrus.

Dr. Mitchill has received from the shores of Long Island a very interesting skull belonging to a species of the genus *Trichecus*. This skull is agatised and in a fine state of preservation. It has been referred to the examination of a committee of the Lyceum, and their report will be found in the second volume of the annals of that excellent Institution.





CONCLUSION.

THIS work has been delayed by uncontrollable circumstances for a much longer period than was anticipated. It is not now the time to offer any apology for the manner in which the undertaking has been accomplished. In reviewing what we have done, it is easy to perceive that much may be hereafter improved. These, and all other deficiencies will no doubt be indicated by those who interest themselves in the execution of such performances. We shall certainly profit by their suggestions, whether made in a spirit of candour or malevolence.

We have been as *original* as it was possible to be, in such a work, unless the whole business of the author's life had been the collection of materials. The observations we have had an opportunity of making from living nature, we fear not to have compared with those made by any other individual. Whenever we have been obliged to compile we have anxiously endeavoured to approximate the truth, and have faithfully acknowledged the aid obtained from different sources.

It has been our intention to render this study pleasing and intelligible, more than to discuss minutiae of classification; to give the *Natural History*, instead of the nomenclature of American animals; to impart information to those seeking for knowledge, rather than to prepare a book for such as consider themselves the founders of systems and settlers of moot points in philosophy. If we have accomplished nothing more, we have rendered it much easier for our successors to attempt the composition of a better work, having saved them the toil of examining a vast number of books, to glean the detached observations worthy of being brought together.

CONCLUSION.

er, I have given thee an Account of my intend-
and endeavours in this performance ; and if it
s I am too conscious to myself, it often hath,)
ed, that I have any where failed of my design ;
long and tedious Work, I have through inad
y, streights of time, and hurry sometimes of other
s, made any balk, and committed mistakes, let thy
ty excuse the human infirmities of Thine, and his
y's Faithful Servant,"

JOHN D. GODMAN.

GENERAL SYNOPSIS
OF
MAMMALIA INHABITING NORTH AMERICA.

BY CHARLES L. BONAPARTE.

Mammalia are vertebrated, warm blooded, viviparous animals; suckling their young; breathing by lungs which float freely in the chest, imperforated; the heart is bilocular and biauricular.

In the present state of science, they form the first class of the first type of the animal kingdom.

GENERAL DIVISIONS,

Or, view of the natural families of the system, adopted in classifying the North American Mammalia.

SUB-CLASS I. QUADRUPEDA.

Limbs four, obvious: head separated from the body by the intervention of a neck.

SECTION I.

Ungiculata; nails covering only the tips of the digits.

§ Three kinds of teeth.

ORDER I. PRIMATES.

Mammæ 2, pectoral: penis free: anterior limbs terminated by hands.

APPENDIX.

TRIBE I. BIMANA.

1. Bimana. Anterior limbs only, terminated
: body vertical, plantigrade.

TRIBE II. QUADRUMANA.

our limbs terminated by hands.

2. Simiæ. Resembling man; 4 incisive teeth
aw.

3. Lemurini. Resembling carnivorous animals;
varying in number, shape and situation; nostrils
of the snout.

4. Dermoptera. Digits of the anterior limbs
, robust, all furnished with compressed incurved
connecting membrane pilous.

ORDER II. CHEIROPTERA.

hæ 2, pectoral; penis free: limbs connected by a
e formed for flying.

5. Cheiroptera. Digits of the anterior limbs

ORDER IV. PINNIPEDIA.

Mammæ abdominal; penis attached to the belly: feet very short, covered by a skin formed for swimming, the posterior turned backward.

Family 9. Pinnipedia.

§§ Not more than two kinds of teeth.

ORDER V. GLIRES.

No canine teeth; incisive 2 below, 2, 4, or 6 above; 22 molar at most; jaws moving horizontally.

* Females with a pouch; both sexes with marsupial bones.

Family 10. Marsupialia. (1) Incisive 2 or 6 above.

** No pouch, no marsupial bones.

† Clavicles distinct omnivorous.

Family 11. Murina.

†† Clavicles rudimental. Herbivorous.

Family 12. Aculeata. Skin covered with prickles; upper incisors 2; toes 4—5.

Family 13. Duplicidentata. Skin covered with hair; upper incisors 4, (6 in young subjects;) toes 5—4.

Family 14. Subungulata. Skin covered with hair; upper incisors 2; molars 16; posterior toes 3 or 5, but lateral each side, very small.

* 5 toed. ** 4—3 toed.

ORDER VI. BRUTA.

No canine nor incisor teeth; (except in one genus in which there are 4 below;) from 14 to 98 molars, or none; nails enveloping the extremities of the digits, almost hoop-shaped.

Family 15. Tardigrada. All having teeth; 18 molars at most; no incisors; snout short; limbs much elongated.

Family 16. Effodientia. Some edentous; some having incisors; molars from 26 to 98; snout elongated; limbs well proportioned to the body.

* Incisors and molars. ** Molars. *** No teeth at all.

‡ Ungulata. †† Vermilingua.

APPENDIX.

SECTION II. UNGULATA.

hoof-shaped; covering the last phalanges of the
no clavicles; the fore-arm always in a state of pro-

ORDER VII. PECORA.

by three kinds of teeth; no incisors above; feet didac-
h two hoofs; the metacarpal and metatarsal bones
four stomachs; ruminating.

ly 17. Carvicornia. No canine teeth; both sexes
permanent horns, composed of a solid nucleus,
from the frontal bones, and of an elastic thin

rymatories; nucleus entirely solid. ** No lacryma-
nucleus of the horns cellular.

ly 18. Devexa. No canine teeth; both sexes with
ent solid horns covered by a skin.

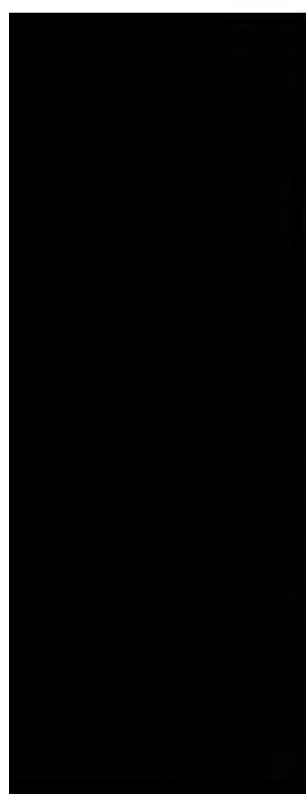
ly 19. Capreoli. No canine teeth; in general the
only having caducious solid, branched horns, cover-
ast for a time by a hirsute skin.

ly 20. Tylopoda. With canine teeth; hornless.

ORDER IX. CETE.

Family 24. Sirenia. Mammæ pectoral; no blow-holes.

Family 25. Hydraula. Mammæ inguinal; with blow-holes.



ANALYTICAL TABLE
OF
THE NORTH AMERICAN GENERA.

ORDER PRIMATES.

FAMILY HUMANÆ.

Genus 1. Homo.

ORDER CHEIROPTERA,

FAMILY CHEIROPTERA.

Genus 2. Vespertilio.

ORDER FERÆ.

FAMILY INSECTIVORA.

Genus 3. Sorex. Ears short, rounded.

Genus 4. Scalops. No external ears : snout simple.

Genus 5. Condylura. No external ears : snout stellated.

FAMILY CARNIVORA.

*** *Plantigrada.* Treading on the whole sole of the foot.**

Genus 6. Ursus. Seven molar on each side : tail short : no anal odoriferous follicles.

Genus 7. Procyon. Six molars on each side : tail very long, pilous : no anal follicles.

Genus 8. Meles. Five molars on each side : tail short, pilous : an anal pouch filled with fetid unctuous substance.

Genus 9. Gulo. Five molars above, six below on each side : tail moderate or short : two folds of the skin near the anus, but no anal pouch.

APPENDIX.

itigrada. Treading on the extremities of their digits.

- a. Only one tuberculous behind the upper carnivorous tooth: body much elongated, vermiform: feet short.
0. *Mustela*. Toes cleft: tail moderate and bushy.
1. *Mephitis*. Toes cleft: tail long and bushy, or wanting.
2. *Lutra*. Toes Palmated.
- b. Two tuberculous behind the upper carnivorous tooth.
3. *Canis*. Feet 5—4 toed; nails not retractile: tongue smooth.
- c. No small tooth behind the inferior large molar.
4. *Felis*. Feet 5—4 toed; nails retractile: tongue prickly.

FAMILY MARSUPIALIA.

5. *Didelphis*.

ORDER PINNIPEDIA

- Genus 21. *Neotoma*. Feet simple; tail cylindrical, hairy: grinders with profound radicles, and with small marked triangles.
- Genus 22. *Sigmodon*. Feet simple; cylindrical, hairy: molars in each jaw, six, subequal, with radicles, and with deep, alternate folds towards the summit.
- Genus 23. *Mus*. Feet simple; tail cylindrical, subnaked, scaly, with scattered hairs.
- Genus 24. *Gerbillus*. Hind feet very long, five toed, each furnished with a distinct metatarsal bone; tail elongated, more or less bushy, but without tuft at tip.
- Genus 25. *Arctomys*. Feet and tail short; nails robust; inferior incisive subulate.
- Genus 26. *Sciurus*. Hind feet turned towards each other; nails very sharp; tail long and bushy; inferior incisive much compressed.
- Genus 27. *Peteromys*. Tail long and bushy; skin of the flanks extended between the fore and hind limbs.

FAMILY ACULEATA.

- Genus 28. *Hystrix*.

FAMILY DUPLICIDENTATA.

- Genus 29. *Lepus*. Hind limbs very long: ears very long: tail short.

ORDER PECORA.

FAMILY CAVICORNIA.

**Nucleus of the horns solid.*

- Genus 30. *Antelope*.

***Nucleus of the horns cellular.*

- Genus 31. *Ovis*. Tail destitute of terminal tuft.

- Genus 32. *Bos*. Tail ending in a bushy tuft.

FAMILY CAPREOLI.

- Genus 33. *Cervus*.

APPENDIX.

ORDER CETE.

FAMILY SIRENIA.

Manatus. Body oblong, ending in an oval, horizontal fin; pectoral fins furnished with rudiments of nails.

Stellerus. Body elongated, ending in a crescent-shaped fin; no rudiment of nails.

FAMILY HYDRAULA.

Delphinus. Head proportioned: teeth.

Monodon. Head proportioned: no teeth.

Physeter. Head exceedingly disproportioned: teeth.

Balæna. Head exceedingly disproportioned: teeth cartilaginous, or rather cartilages instead of teeth.

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RAMBLES OF A NATURALIST.

No. I.

FROM early youth devoted to the study of nature, it has always been my habit to embrace every opportunity of increasing my knowledge and pleasures by actual observation, and I have found ample means of gratifying this disposition, wherever my place has been allotted by Providence. When an inhabitant of the country, it was sufficient to go a few steps from the door to be in the midst of numerous interesting objects; when a resident of the crowded city, a healthful walk of half an hour placed me where my favourite enjoyment was offered in abundance; and now, when no longer able to seek in fields and woods and running streams for that knowledge which cannot readily be elsewhere obtained, the recollection of my former rambles is productive of a satisfaction which past pleasures but seldom bestow. Perhaps a statement of the manner in which my studies were pursued may prove interesting to those who love the works of nature, and may not be aware how great a field for original observation is within their reach, or how vast a variety of instructive objects are easily accessible, even to the occupants of a bustling metropolis. To me it will be a source of great delight to spread these resources before the reader, and enable him so cheaply to participate in the pleasures I have enjoyed, as well as place him in the way of enlarging the general stock of knowledge by communicating the results of his original observations.

One of my favourite walks was through Turner's-lane, near Philadelphia, which is about a quarter of a mile long, and not much wider than an ordinary street, being closely fenced in on both sides; yet my reader may feel surprised when informed that I found ample employment for all my leisure, during six weeks, within and about its precincts. On entering the lane from the Ridge-road, I observed a gentle elevation of the turf beneath the lower rails of the fence, which appeared to be uninterruptedly continuous; and when I had cut through the verdant roof with my knife, it proved

to be a regularly arched gallery or subterranean road, along which the inhabitants could securely travel at all hours without fear of discovery. The sides and bottom of this arched way were smooth and clean, as if much used; and the raised superior portion had long been firmly consolidated by the grass roots, intermixed with tenacious clay. At irregular and frequently distant intervals, a side path diverged into the neighbouring fields, and by its superficial situation, irregularity, and frequent openings, showed that its purpose was temporary, or had been only opened for the sake of procuring food. Occasionally I found a little gallery diverging from the main route beneath the fence, towards the road, and finally opening on the grass, as if the inmate had come out in the morning to breathe the early air, or to drink of the crystal dew which daily gemmed the close cropped verdure. How I longed to detect the animal which tenanted these galleries, in the performance of his labours! Farther on, upon the top of a high bank, which prevented the pathway from continuing near the fence, appeared another evidence of the industry of my yet unknown miner. Half a dozen hillocks of loose, almost pulverized earth, were thrown up, at irregular distances, communicating with the main gallery by side passages. Opening one of these carefully, it appeared to differ little from the common gallery in size, but it was very difficult to ascertain where the loose earth came from, nor have I ever been able to tell, since I never witnessed the formation of these hillocks, and conjectures are forbidden where nothing but observation is requisite to the decision. My farther progress was now interrupted by a delightful brook which sparkled across the road over a clear, sandy bed; and here my little galleries turned into the field, coursing along at a moderate distance from the stream. I crept through the fence into the meadow on the west side, intending to discover, if possible, the animal whose works had first fixed my attention; but as I approached the bank of the rivulet, something suddenly retreated towards the grass, seeming to vanish almost unaccountably from sight. Very carefully examining the point at which it disappeared, I found the entrance of another gallery or burrow, but of very different construction from that first observed. This new one was formed in the grass, near and among whose roots and lower stems a small but regular covered way was practised. Endless, however, would have been the attempt to follow this, as it opened in various directions, and ran irregularly into the field, and towards the brook, by a great variety of passages. It evidently belonged to an animal totally different from the

owner of the subterranean passage, as I subsequently discovered, and may hereafter relate. Tired of my unavailing pursuit, I now returned to the little brook, and seating myself on a stone, remained for some time unconsciously gazing on the fluid which gushed along in unsullied brightness over its pebbly bed. Opposite to my seat was an irregular hole in the bed of the stream, into which, in an idle mood, I pushed a small pebble with the end of my stick. What was my surprise, in a few seconds afterwards, to observe the water in this hole in motion, and the pebble I had pushed into it gently approaching the surface. Such was the fact; the hole was the dwelling of a stout little crayfish or fresh water lobster, who did not choose to be incommoded by the pebble, though doubtless he attributed its sudden arrival to the usual accidents of the stream, and not to my thoughtless movements. He had thrust his broad lobster-like claws under the stone, and then drawn them near to his mouth; thus making a kind of shelf; and as he reached the edge of the hole, he suddenly extended his claws, and rejected the encumbrance from the lower side, or down stream. Delighted to have found a living object with whose habits I was unacquainted, I should have repeated my experiment, but the crayfish presently returned with what might be called an armful of rubbish, and threw it over the side of his cell, and down the stream as before. Having watched him for some time while thus engaged, my attention was caught by the considerable number of similar holes along the margin and in the bed of the stream. One of these I explored with a small rod, and found it to be eight or ten inches deep, and widened below into a considerable chamber, in which the little lobster found a comfortable abode. Like all of his tribe, the crayfish makes considerable opposition to being removed from his dwelling, and bit smartly at the stick with his claws: as my present object was only to gain acquaintance with his dwelling, he was speedily permitted to return to it in peace.

Under the end of a stone lying in the bed of the stream, something was floating in the pure current, which at first seemed like the tail of a fish; and being desirous to obtain a better view, I gently raised the stone on its edge, and was rewarded by a very beautiful sight. The object first observed was the tail of a beautiful salamander, whose sides were of a pale straw colour, flecked with circlets of the richest crimson. Its long lizard-like body seemed to be semitransparent, and its slender limbs appeared like mere productions of the skin. Not far distant, and near where the upper end of the stone

had been, lay crouched, as if asleep, one of the most beautifully coloured frogs I had ever beheld. Its body was slender compared with most frogs, and its skin covered with stripes of bright reddish brown and grayish green, in such a manner as to recall the beautiful markings of the tiger's hide; and since the time alluded to, it has received the name of *tigrina* from Leconte, its first scientific describer. How long I should have been content to gaze at these beautiful animals, as they lay basking in the living water, I know not, had not the intense heat made me feel the necessity of seeking a shade. It was now past twelve o'clock; I began to retrace my steps towards the city; and without any particular object, moved along the little galleries examined in the morning. I had advanced but a short distance, when I found the last place where I had broken open the gallery was *repaired*. The earth was perfectly fresh, and I had lost the chance of discovering the miner, while watching my new acquaintances in the stream. Hurrying onward, the same circumstance uniformly presented; the injuries were all efficiently repaired, and had evidently been very recently completed. Here was one point gained; it was ascertained that these galleries were still inhabited, and I hoped soon to become acquainted with the inmates. But at this time it appeared fruitless to delay longer, and I returned home, filled with anticipations of pleasure from the success of my future researches. These I shall relate on another occasion, if such narrations as the present be thought of sufficient interest to justify their presentation to the reader.

No. II.

ON the day following my first related excursion, I started early in the morning, and was rewarded by one sight, which could not otherwise have been obtained, well worth the sacrifice of an hour or two of sleep. There may be persons who will smile contemptuously at the idea of a man's being delighted with such trifles; nevertheless, we are not inclined to envy such as disesteem the pure gratification afforded by these simple and easily accessible pleasures. As I crossed an open lot on my way to the lane, a succession of gossamer spider webs, lightly suspended from various weeds and small shrubs, attracted my attention. The dew which had formed during the night was condensed upon this delicate lace, in

globules of most resplendent brilliance, whose clear lustre pleased while it dazzled the sight. In comparison with the immaculate purity of these dewdrops, which reflected and refracted the morning light in beautiful rays as the gossamer webs trembled in the breeze, how poor would appear the most invaluable diamonds that were ever obtained from Golconda or Brazil! How rich would any monarch be that could boast the possession of *one* such, as here glittered in thousands on every herb and spray! They are exhaled in an hour or two and lost, yet they are almost daily offered to the delighted contemplation of the real lover of nature, who is ever happy to witness the beneficence of the great Creator, not less displayed in trivial circumstances than the most wonderful of his works.

No particular change was discoverable in the works of my little miners, except that all the places which had been a second time broken down were again repaired, showing that the animal had passed between the times of my visit; and it may not be uninteresting to observe how the repair was effected. It appeared, when the animal arrived at the spot broken open or exposed to the air, that it changed its direction sufficiently downwards to raise enough of earth from the lower surface to fill up the opening; this of course slightly altered the direction of the gallery at this point, and though the earth thrown up was quite pulverulent, it was so nicely arched as to retain its place, and soon became consolidated. Having broken open a gallery where the turf was very close, and the soil tenacious, I was pleased to find the direction of the chamber somewhat changed; on digging farther with my clasp knife, I found a very beautiful cell excavated in very tough clay, deeper than the common level of the gallery and towards one side. This little lodging-room would probably have held a small melon, and was nicely arched all round. It was perfectly clear, and quite smooth, as if much used; to examine it fully, I was obliged to open it completely. (The next day, it was replaced by another, made a little farther to one side, exactly of the same kind; it was replaced a second time, but when broken up a third time it was left in ruins.) As twelve o'clock approached, my solicitude to discover the little miner increased to a considerable degree; previous observation led me to believe that about that time his presence was to be expected. I had trodden down the gallery for some inches in a convenient place, and stood close by, in vigilant expectation. My wishes were speedily gratified; in a short time the flattened gallery began at one end to be raised to its former convexity,

and the animal rapidly advanced. With a beating heart, I thrust the knife blade down by the side of the rising earth, and quickly turned it over to one side, throwing my prize fairly into the sunshine. For an instant, he seemed motionless from surprise, when I caught and imprisoned him in my hat. It would be vain for me to attempt a description of my pleasure in having thus succeeded, small as was my conquest. I was delighted with the beauty of my captive's fur; with the admirable adaptation of his diggers or broad rose-tinted hands; the wonderful strength of his forelimbs, and the peculiar suitableness of his head and neck to the kind of life the Author of nature had designed him for. It was the shrew-mole, or *scalops canadensis*, whose history and peculiarities of structure are minutely related in the first volume of Godman's American Natural History. All my researches never enabled me to discover a nest, female, or young one of this species. All I ever caught were males, though this most probably was a mere accident. The breeding of the scalops is nearly all that is wanting to render our knowledge of it complete.

This little animal has eyes, though they are not discoverable during its living condition, nor are they of any use to it above ground. In running round a room, (until it had perfectly learned where all the obstacles stood,) it would uniformly strike hard against them with its snout, and then turn. It appeared to me as singular that a creature which fed upon living earth worms with all the greediness of a pig, would not destroy the larvæ or maggots of the flesh fly. A shrew-mole lived for many weeks in my study, and made use of a gun case, into which he squeezed himself, as a burrow. Frequently he would carry the meat he was fed with into his retreat; and as it was warm weather, the flies deposited their eggs in the same place. An offensive odour led me to discover this circumstance, and I found a number of large larvæ, over which the shrew-mole passed without paying them any attention: nor would he, when hungry, accept of such food, though nothing could exceed the eager haste with which he seized and munched earth worms. Often when engaged in observing him thus employed, have I thought of the stories told me, when a boy, of the manner in which snakes were destroyed by swine; his voracity readily exciting a recollection of one of these animals, and the poor worms writhing and twining about his jaws answering for the snakes. It would be tedious were I to relate all my rambles undertaken with a view to gain a proper

acquaintance with this creature, at all hours of the day, and late in the evening, before daylight, &c. &c.

Among other objects which served as an unfailing source of amusement, when resting from the fatigue of my walks, was the little inhabitant of the brook, called the *gyrinus natator*. These merry swimmers occupied every little sunny pool in the stream, apparently altogether engaged in sport. A circumstance connected with these insects gives them additional interest to a close observer; they are allied by their structure and nature to those nauseous vermin, the cimices, (or *bed-bugs*.) All of which, whether found infesting fruits or our dormitories, are distinguished by their disgusting odour. But their distant relatives, called by the boys the *water-witches* and *apple-smellers*, the *gyrinus natator* above alluded to, has a delightful smell, exactly similar to that of the richest, mellowest apple. This peculiarly pleasant smell frequently causes the idler many unavailing efforts to secure some of these creatures, whose activity in water renders their pursuit very difficult, though by no means so much so as that of some of the long legged water spiders, which walk the waters dry shod, and evade the grasp with surprising ease and celerity. What purposes either of these races serve in the great economy of nature has not yet been ascertained, and will scarcely be determined until our store of *facts* is far more extensive than at present. Other and still more remarkable inhabitants of the brook, at the same time, came within my notice, and afforded much gratification in the observation of their habits.

No. III.

IN moving along the borders of the stream, we may observe, where the sand or mud is fine and settled, a sort of mark or cutting, as if an edged instrument had been drawn along, so as to leave behind it a track or groove. At one end of this line, by digging a little into the mud with the hand, you will generally discover a shell of considerable size, which is tenanted by a molluscous animal of singular construction. On some occasions, when the mud is washed off from the shell, you will be delighted to observe the beautifully regular dark lines with which its greenish smooth surface is marked. Other species are found in the same situations, which, externally, are rough and inelegant, but within are ornamented to

a most admirable degree, presenting a smooth surface of the richest pink, crimson, or purple, to which we have nothing of equal elegance to compare it. If the mere shells of these creatures be thus splendid, what shall we say of their internal structure, which, when examined by the microscope, offers a succession of wonders? The beautiful apparatus for respiration, formed of a network regularly arranged, of the most exquisitely delicate texture; the foot, or organ by which the shell is moved forward through the mud or water, composed of an expanded spongy extremity, capable of assuming various figures to suit particular purposes, and governed by several strong muscles that move it in different directions; the ovaries, filled with myriads, not of eggs, but of perfect shells, or complete little animals, which, though not larger than the point of a fine needle, yet, when examined by the microscope, exhibit all the peculiarities of conformation that belong to the parent; the mouth, embraced by the nervous ganglion, which may be considered as the animal's brain; the stomach, surrounded by the various processes of the liver, and the strongly acting but transparent heart, all excite admiration and gratify our curiosity. The puzzling question often presents itself to the inquirer, why so much elaborateness of construction, and such exquisite ornament as are common to most of these creatures, should be bestowed? Destined to pass their lives in and under the mud, possessed of no sense that we are acquainted with, except that of touch, what purpose can ornament serve in them? However much of vanity there may be in asking the question, there is no answer to be offered. We cannot suppose that the individuals have any power of admiring each other, and we know that the foot is the only part they protrude from their shell, and that the inside of the shell is covered by the membrane called the mantle. Similar remarks may be made relative to conchology at large: the most exquisitely beautiful forms, colours, and ornaments are lavished upon genera and species which exist only at immense depths in the ocean, or buried in the mud; nor can any one form a satisfactory idea of the object the great Author of nature had in view, in thus profusely beautifying creatures occupying so low a place in the scale of creation.

European naturalists have hitherto fallen into the strangest absurdities concerning the motion of the bivalved shells, which five minutes' observation of nature would have served them to correct. Thus, they describe the upper part of the shell as the *lower*, and the *hind* part as the front, and speak of them as moving along on their rounded convex surface,

like a boat on its keel; instead of advancing with the edges or open part of the shell towards the earth. All these mistakes have been corrected, and the true mode of progression indicated from actual observation, by our fellow citizen, Isaac Lea, whose recently published communications to the American Philosophical Society reflect the highest credit upon their author, who is a naturalist in the best sense of the term.

As I wandered slowly along the borders of the run, towards a little wood, my attention was caught by a considerable collection of shells lying near an old stump. Many of these appeared to have been recently emptied of their contents, and others seemed to have long remained exposed to the weather. On most of them, at the thinnest part of the edge, a peculiar kind of fracture was obvious, and this seemed to be the work of an animal. A closer examination of the locality showed the footsteps of a quadruped, which I readily believed to be the muskrat; more especially as, upon examining the adjacent banks, numerous traces of burrows were discoverable. It is not a little singular that this animal, unlike all others of the larger gnawers, as the beaver, &c., appears to increase instead of diminishing with the increase of population. Whether it is that the dams and other works thrown up by men afford more favourable situations for their multiplication, or their favourite food is found in greater abundance, they certainly are quite as numerous now, if not more so, than when the country was first discovered, and are to be found at this time almost within the limits of the city. By the construction of their teeth, as well as all the parts of the body, they are closely allied to the rat kind; though in size, and some peculiarities of habit, they more closely approximate the beaver. They resemble the rat especially, in not being exclusively herbivorous, as is shown by their feeding on the uniones or muscles above mentioned. To obtain this food requires no small exertion of their strength; and they accomplish it by introducing the claws of their fore-paws between the two edges of the shell, and tearing it open by main force. Whoever has tried to force open one of these shells, containing a living animal, may form an idea of the effort made by the muskrat: the strength of a strong man would be requisite to produce the same result in the same way.

The burrows of muskrats are very extensive, and consequently injurious to dikes and dams, meadow banks, &c. The entrance is always under water, and thence sloping upwards above the level of the water; so that the muskrat

has to dive in going in and out. These creatures are excellent divers and swimmers; and being nocturnal, are rarely seen, unless by those who watch for them at night. Sometimes we alarm one near the mouth of the den, and he darts away across the water, near the bottom, marking his course by a turbid streak in the stream: occasionally we are made aware of the passage of one to some distance down the current in the same way; but, in both cases, the action is so rapidly performed, that we should scarcely imagine what was the cause, if not previously informed. Except by burrowing into and spoiling the banks, they are not productive of much evil, their food consisting principally of the roots of aquatic plants, in addition to shellfish. The musky odour, which gives rise to their common name, is caused by glandular organs placed near the tail, filled with a viscid and powerfully musky fluid, whose uses we know but little of, though it is thought to be intended as a guide by which these creatures may discover each other. This inference is strengthened by finding some such contrivance in different races of animals, in various modifications. A great number carry it in pouches similar to those just mentioned. Some, as the musk animal, have the pouch under the belly; the shrew has the glands on the side; the camel on the back of the neck; the crocodile under the throat, &c. At least no other use has ever been assigned for this apparatus; and in all creatures possessing it, the arrangement seems to be adapted peculiarly to the habits of the animals. The crocodile, for instance, generally approaches the shore in such a manner as to apply the neck and throat to the soil, while the hinder part of the body is under water. The glands under the throat leave the traces of his presence, therefore, with ease, as they come in contact with the shore. The glandular apparatus on the back of the neck of the male camel seems to have reference to the general elevation of the olfactory organs of the female; and the dorsal gland of the peccary no doubt has some similar relation to the peculiarities of the race.

The value of the fur of the muskrat causes many of them to be destroyed, which is easily enough effected by means of a trap. This is a simple box, formed of rough boards nailed together, about three feet long, having an iron door, made of pointed bars, opening *inwards*, at both ends of the box. This trap is placed with the end opposite to the entrance of a burrow observed during the daytime. In the night, when the muskrat sallies forth, he enters the box, instead of passing into the open air, and is drowned, as the

box is quite filled with water. If the traps be visited and emptied during the night, two may be caught in each trap, as muskrats from other burrows may come to visit those where the traps are placed, and thus one be taken going in as well as on coming out. These animals are frequently very fat, and their flesh has a very wholesome appearance, and would probably prove good food. The musky odour, however, prejudices strongly against its use; and it is probable that the flesh is rank, as the muscles it feeds on are nauseous and bitter, and the roots which supply the rest of its food are generally unpleasant and acrid. Still, we should not hesitate to partake of its flesh in case of necessity, especially if of a young animal, from which the musk bag had been removed immediately after it was killed.

In this vicinity, the muskrat does not build himself a house for the winter, as our fields and dikes are too often visited. But in other parts of the country, where extensive marshes exist, and muskrats are abundant, they build very snug and substantial houses, quite as serviceable and ingenious as those of the beaver. They do not dam the water as the beaver, nor cut branches of trees to serve for the walls of their dwellings. They make it of mud and rushes, raising a cone two or three feet high, having the entrance on the south side under water. About the year 1804, I saw several of them in Worrell's marsh, near Chestertown, Maryland, which were pointed out to me by an old black man, who made his living principally by trapping these animals, for the sake of their skins. A few years since, I visited the marshes near the mouth of Magerthy river, in Maryland, where I was informed by a resident that the muskrats still built regularly every winter. Perhaps these quadrupeds are as numerous in the vicinity of Philadelphia as elsewhere, as I have never examined a stream of fresh water, diked meadow, or milldam hereabout, without seeing traces of vast numbers. Along all the water courses and meadows in Jersey, opposite Philadelphia, and in the meadows of the neck below the navy yard, there must be large numbers of muskrats. Considering the value of the fur, and the ease and trifling expense at which they might be caught, we have often felt surprised that more of them are not taken, especially as we have so many poor men complaining of wanting something to do. By thinning the number of muskrats, a positive benefit would be conferred on the farmers and furriers, to say nothing of the profits to the individual.

No. IV.

My next visit to my old hunting ground, the lane and brook, happened on a day in the first hay harvest, when the verdant sward of the meadows was rapidly sinking before the keen edged scythes swung by vigorous mowers. This unexpected circumstance afforded me considerable pleasure, for it promised me a freer scope to my wanderings, and might also enable me to ascertain various particulars concerning which my curiosity had long been awakened. Nor was this promise unattended by fruition of my wishes. The reader may recollect that, in my first walk, a neat burrow in the grass, above ground, was observed, without my knowing its author. The advance of the mowers explained this satisfactorily; for in cutting the long grass, they exposed several nests of field mice, which, by means of these grass-covered alleys, passed to the stream in search of food or drink, unseen by their enemies, the hawks and owls. The numbers of these little creatures were truly surprising; their fecundity is so great, and their food so abundant, that were they not preyed upon by many other animals, and destroyed in great numbers by man, they would become exceedingly troublesome. There are various species of them, all bearing a very considerable resemblance to each other, and having, to an incidental observer, much of the appearance of the domestic mouse. Slight attention, however, is requisite to perceive very striking differences; and the discrimination of these will prove a source of considerable gratification to the inquirer. The nests are very nicely made, and look much like a bird's nest, being lined with soft materials, and usually placed in some snug little hollow, or at the root of a strong tuft of grass. Upon the grass roots and seeds these nibblers principally feed; and, where very abundant, the effects of their hunger may be seen in the brown and withered aspect of the grass they have injured at the root. But, under ordinary circumstances, the hawks, owls, domestic cat, weasels, crows, &c., keep them in such limits as prevent them from doing essential damage.

I had just observed another and a smaller grassy covered way, where the mowers had passed along, when my attention was called towards a wagon at a short distance, which was receiving its load. Shouts and laughter, accompanied by a general running and scrambling of the people, indicated that some rare sport was going forward. When I

approached I found that the object of chase was a jumping-mouse, whose actions it was truly delightful to witness. When not closely pressed by its pursuers, it ran with some rapidity in the usual manner, as if seeking concealment. But in a moment it would vault into the air, and skim along for ten or twelve feet, looking more like a bird than a little quadruped. After continuing this for some time, and nearly exhausting its pursuers with running and falling over each other, the frightened creature was accidentally struck down by one of the workmen, during one of its beautiful leaps, and killed. As the hunters saw nothing worthy of attention in the dead body of the animal, they very willingly resigned it to me; and with great satisfaction I retreated to a willow shade, to read what nature had written in its form for my instruction. The general appearance was mouse-like; but the length and slenderness of the body, the shortness of its fore limbs, and the disproportionate length of its hind limbs, together with the peculiarity of its tail, all indicated its adaptation to the peculiar kind of action I had just witnessed. A sight of this little creature vaulting or bounding through the air strongly reminded me of what I had read of the great kangaroo of New Holland; and I could not help regarding our little jumper as in some respects a sort of miniature resemblance of that curious animal. It was not evident, however, that the jumping-mouse derived the aid from its tail, which so powerfully assists the kangaroo. Though long, and sufficiently stout in proportion, it had none of the robust muscularity which, in the New Holland animal, impels the lower part of the body immediately upward. In this mouse, the leap is principally, if not entirely, effected by a sudden and violent extension of the long hind limbs, the muscles of which are strong, and admirably suited to their object. We have heard that these little animals feed on the roots, &c., of the green herbage, and that they are every season to be found in the meadows. It may, perhaps, puzzle some to imagine how they subsist through the severities of winter, when vegetation is at rest, and the earth generally frozen. Here we find another occasion to admire the all-perfect designs of the awful Author of nature, who has endowed a great number of animals with the faculty of retiring into the earth, and passing whole months in a state of repose so complete as to allow all the functions of the body to be suspended, until the returning warmth of the spring calls them forth to renewed activity and enjoyment. The jumping-mouse, when the chill weather begins to draw nigh, digs down about six or eight inches into the soil. and

there forms a little globular cell, as much larger than his own body as will allow a sufficient covering of fine grass to be introduced. This being obtained, he contrives to coil up his body and limbs in the centre of the soft dry grass, so as to form a complete ball; and so compact is this, that, when taken out, with the torpid animal, it may be rolled across a floor without injury. In this snug cell, which is soon filled up and closed externally, the jumping-mouse securely abides through all the frosts and storms of winter, needing neither food nor fuel, being utterly quiescent, and apparently dead, though susceptible at any time of reanimation, by being very gradually stimulated by light and heat.

The little burrow under examination, when called to observe the jumping-mouse, proved to be made by the merry musicians of the meadows, the field crickets; *acheta campestris*. These lively black crickets are very numerous, and contribute very largely to that general song which is so delightful to the ear of the true lover of nature, as it rises on the air from myriads of happy creatures rejoicing amid the bounties conferred on them by Providence. It is not a voice that the crickets utter, but a regular vibration of musical chords, produced by nibbling the nervures of the elytra against a sort of network intended to produce the vibrations. The reader will find an excellent description of the apparatus in Kirby & Spence's book; but he may enjoy a much more satisfactory comprehension of the whole, by visiting the field cricket in his summer residence, see him tuning his viol, and awakening the echoes with his music. By such an examination as may be there obtained, he may derive more knowledge than by frequent perusal of the most eloquent writings, and perhaps observe circumstances which the learned authors are utterly ignorant of.

Among the great variety of burrows formed in the grass, or under the surface of the soil, by various animals and insects, there is one that I have often anxiously, and as yet fruitlessly, explored. This burrow is formed by the smallest quadruped animal known to man, the minute *shrew*, which, when full grown, rarely exceeds the weight of *thirty-six grains*. I had seen specimens of this very interesting creature in the museum, and had been taught, by a more experienced friend, to distinguish its burrow, which I have often perseveringly traced, with the hope of finding the living animal, but in vain. On one occasion, I patiently pursued a burrow nearly round a large barn, opening it all the way. I followed it under the barn floor, which was sufficiently high to allow me to crawl beneath. There I

traced it about to a tiresome extent, and was at length rewarded by discovering where it terminated, under a foundation stone, perfectly safe from my attempts. Most probably a whole family of them were then present, and I had my labour for my pains. As these little creatures are nocturnal, and are rarely seen from the nature of the places they frequent, the most probable mode of taking them alive would be by placing a small mousetrap in their way, baited with a little tainted or slightly spoiled meat. If a common mousetrap be used, it is necessary to work it over with additional wire, as this shrew could pass between the bars even of a close mousetrap. They are sometimes killed by cats, and thus obtained, as the cat never eats them, perhaps on account of their rank smell, owing to a peculiar glandular apparatus on each side that pours out a powerfully odorous greasy substance. The species of the shrew genus are not all so exceedingly diminutive, as some of them are even larger than a common mouse. They have their teeth coloured at the tips in a remarkable manner; it is generally of a pitchy brown, or dark chestnut hue, and, like the colouring of the teeth in the beaver and other animals, is owing to the enamel being thus formed, and not to any mere accident of diet. The shrews are most common about stables and cow houses; and there, should I ever take the field again, my traps shall be set, as my desire to have one of these little quadrupeds is still as great as ever.

No. V.

HITHERTO my rambles have been confined to the neighbourhood of a single spot, with a view of showing how perfectly accessible to all are numerous and various interesting natural objects. This habit of observing in the manner indicated began many years anterior to my visit to the spots heretofore mentioned, and have extended through many parts of our own and another country. Henceforward my observations shall be presented without reference to particular places, or even of one place exclusively, but with a view to illustrate whatever may be the subject of description, by giving all I have observed of it under various circumstances.

A certain time of my life was spent in that part of Anne Arundel county, Maryland, which is washed by the river Patapsco on the north, the great Chesapeake bay on the west,

RAMBLES OF A NATURALIST.

Severn river on the south. It is in every direction by creeks, or arms of the rivers and bay, into long, narrow strips of land, called necks, the greater part of which is covered by dense pine forests, or thickets of small shrubs and vines, rendered impervious to human footsteps by the tangle of vines, whose inextricable mazes nothing but a fox, or weasel could thread. The soil cleared for cultivation is very generally poor, light, and sandy, though readily susceptible of improvement, and yielding a considerable product of Indian corn, and most of the early garden vegetables, raising of which for the Baltimore market the inhabitants obtain all their ready money. The blight of slavery has extended its influence over this region, where all the effects are but too obviously visible. The white population are few in number, widely distant from each other, and manifest, in their mismanagement and half-indigent condition, how trifling an advantage they derive from the freedom of their dozen or more of sturdy blacks, of all sexes and ages. The number of marshes formed at the mouths of the creeks render this country frightfully unhealthy in autumn, at which time the life of a resident is one of incessant toil and severe privation. Riding out in the morning till night, to get round to visit a few patients,

most positive seclusion; the white people are all busily employed in going to and from market; and even were they at home, they are poorly suited for companionship. I here spent month after month, and, except the patients I visited, saw no one but the blacks; the house in which I boarded was kept by a widower, who, with myself, was the only white man within the distance of a mile or two. My only compensation was this, the house was pleasantly situated on the bank of Curtis's creek, a considerable arm of the Patapsco, which extended for a mile or two beyond us, and immediately in front of the door expanded so as to form a beautiful little bay. Of books I possessed very few, and those exclusively professional; but in this beautiful expanse of sparkling water, I had a book opened before me, which a lifetime would scarcely suffice me to read through. With the advantage of a small but neatly made and easily manageable skiff, I was always independent of the service of the blacks, which was ever repugnant to my feelings and principles. I could convey myself in whatever direction the objects of inquiry might present, and as my little bark was visible for a mile in either direction from the house, a handkerchief waved, or the loud shout of a negro, was sufficient to recall me, in case my services were required.

During the spring months, and while the garden vegetables are yet too young to need a great deal of attention, the proprietors frequently employ their blacks in hauling the seine; and this in these creeks is productive of an ample supply of yellow perch, which affords a very valuable addition to the diet of all. The blacks in an especial manner profit by this period of plenty, since they are permitted to eat of them without restraint, which cannot be said of any other sort of provision allowed them. Even the pigs and crows obtain their share of the abundance, as the fishermen, after picking out the best fish, throw the smaller ones on the beach. But as the summer months approach, the aquatic grass begins to grow, and this fishing can no longer be continued, because the grass rolls the seine up in a wisp, so that it can contain nothing. At this time the spawning season of the different species of sun-fish begins, and to me this was a time of much gratification. Along the edge of the river, where the depth of water was not greater than from four feet to as shallow as twelve inches, an observer would discover a succession of circular spots cleared of the surrounding grass, and showing a clear sandy bed. These spots, or cleared spaces, we may regard as the nest of this beautiful fish. There, balanced in the transparent wave, at the distance of six or eight inches

from the bottom, the sun-fish is suspended in the glittering sunshine, gently swaying its beautiful tail and fins; or, wheeling around in the limits of its little circle, appears to be engaged in keeping it clear of all encumbrances. Here the mother deposits her eggs or spawn, and never did her guard her callow brood with more eager vigilance than the sun-fish the little circle within which her promised offspring are deposited. If another individual approach too closely to her borders, with a fierce and angry air she darts against it, and forces it to retreat. Should any small and not too heavy object be dropped in the nest, it is examined with jealous attention, and displaced if the owner be not satisfied of its harmlessness. At the approach of man she flies with great velocity into deep water, as if willing to conceal that her presence was more than accidental where first seen. She may, after a few minutes, be seen cautiously venturing to return, which is at length done with velocity; then she would take a hurried turn or two around, and scud back again to the shady bowers formed by the river grass, which grows up from the bottom to within a few feet of the surface, and attains to twelve, fifteen, or more feet in length. Again she ventures forth from the depths; and if no further cause of fear presented, would gently sail into the placid circle of her home, and with obvious satisfaction explore it in every part.

Besides the absolute pleasure I derived from visiting the habitations of these glittering tenants of the river, hanging over them from my little skiff, and watching their every action, they frequently furnished me with a very acceptable addition to my frugal table. Situated as my boarding house was, and all the inmates of the house busily occupied in raising vegetables to be sent to market, our bill of fare offered little other change than could be produced by varying the mode of cookery. It was either broiled bacon and potatoes, or fried bacon and potatoes, or cold bacon and potatoes, and so on at least six days out of seven. But, as soon as I became acquainted with the habits of the sun-fish, I procured a neat circular iron hoop for a net; secured to it a piece of an old seine, and whenever I desired to dine on *fresh* fish, it was only necessary to take my skiff, and push her gently along from one sun-fish nest to another, myriads of which might be seen along all the shore. The fish, of course, darted off as soon as the boat first drew near, and during this absence the net was placed so as to cover the nest, of the bottom of which the meshes but slightly intercepted the view. Finding all things quiet, and not being disturbed by the net, the fish would resume its central station, the net was suddenly

raised, and the captive placed in the boat. In a quarter of an hour, I could generally take as many in this way as would serve two men for dinner, and when an acquaintance accidentally called to see me during the season of sun-fish, it was always in my power to lessen our dependence on the endless bacon. I could also always select the finest and largest of these fish, as while standing up in the boat one could see a considerable number at once, and thus choose the best. Such was their abundance, that the next day would find all the nests re-occupied. Another circumstance connected with this matter gave me no small satisfaction; the poor blacks, who could rarely get time for angling, soon learned how to use my net with dexterity; and thus, in the ordinary time allowed them for dinner, would borrow it, run down to the shore, and catch some fish to add to their very moderate allowance.

No. VI.

AFTER the sun-fish, as regular annual visitants of the small rivers and creeks containing salt or brackish water, came the crabs in vast abundance, though for a very different purpose. These singularly constructed and interesting beings furnished me with another excellent subject for observation; and, during the period of their visitation, my skiff was in daily requisition. Floating along with an almost imperceptible motion, a person looking from the shore might have supposed her entirely adrift; for as I was stretched at full length across the seats, in order to bring my sight as close to the water as possible without inconvenience, no one would have observed my presence from a little distance. The crabs belong to a very extensive tribe of beings, which carry their *skeletons* on the *outside* of their bodies, instead of within; and of necessity the fleshy, muscular, or moving power of the body, is placed in a situation the reverse of what occurs in animals of a higher order, which have internal skeletons or solid frames to their systems. This peculiarity of the crustaceous animals, and various other beings, is attended with one apparent inconvenience; when they have grown large enough to fill their shell or skeleton, completely, they cannot grow farther, because the skeleton being external, is incapable of enlargement. To obviate this difficulty, the Author of nature has endowed them with the power of casting off the entire

shell, increasing in size, and forming another equally hard and perfect, for several seasons successively, until the greatest or maximum size is attained, when the change or sloughing ceases to be necessary, though it is not always discontinued on that account. To undergo this change with greater ease and security, the crabs seek retired and peaceful waters, such as the beautiful creek I have been speaking of, whose clear, sandy shores are rarely disturbed by waves causing more than a pleasing murmur, and where the number of enemies must be far less in proportion than in the boisterous waters of the Chesapeake, their great place of concourse. From the first day of their arrival in the latter part of June, until the time of their departure, which in this creek occurred towards the first of August, it was astonishing to witness the vast multitudes which flocked towards the head of the stream.

It is not until they have been for some time in the creek that the moult or sloughing generally commences. They may be then observed gradually coming closer in shore, to where the sand is fine, fairly exposed to the sun, and a short distance farther out than the lowest water mark, as they must always have at least a depth of three or four inches water upon them.

The individual, having selected his place, becomes perfectly quiescent, and no change is observed during some hours but a sort of swelling along the edges of the great upper shell at its back part. After a time this posterior edge of the shell becomes fairly disengaged like the lid of a chest; and now begins the more difficult work of withdrawing the great claws from their cases, which every one recollects to be vastly larger at their extremities, and between the joints, than the joints themselves. A still greater apparent difficulty presents in the shedding of the sort of tendon which is placed within the muscles. Nevertheless, the Author of nature has adapted them to the accomplishment of all this. The disproportionate sized claws undergo a peculiar softening, which enables the crab, by a very steadily continued, scarcely perceptible effort, to pull them out of their shells, and the business is completed by the separation of the complex parts about the mouth and eyes. The crab now slips out from the slough, settling near it on the sand. It is now covered by a soft, perfectly flexible skin; and though possessing precisely the same form as before, seems incapable of the slightest exertion. Notwithstanding that such is its condition, while you are gazing on this helpless creature, it is sinking in the fine loose sand, and in a short time is covered up sufficiently to escape the observation

of careless or inexperienced observers. Neither can one say how this is effected, although it occurs under their immediate observation; the motions employed to produce the displacement of the sand are too slight to be appreciated, though it is most probably owing to a gradual lateral motion of the body, by which the sand is displaced in the centre beneath, and thus gradually forced up at the sides until it falls over and covers the crab. Examine him within twelve hours, and you will find the skin becoming about as hard as fine writing paper, producing a similar crackling, if compressed; twelve hours later the shell is sufficiently stiffened to require some slight force to bend it, and the crab is said to be in *buckram*, as in the first stage it was in *paper*. It is still helpless, and offers no resistance; but, at the end of thirty-six hours, it shows that its natural instincts are in action; and by the time forty-eight hours have elapsed, the crab is restored to the exercise of all his functions. I have stated the above as the periods in which the stages of the moult are accomplished; but I have often observed that the rapidity of this process is very much dependent upon the temperature, and especially upon sunshine. A cold, cloudy, raw, and disagreeable spell, happening at this period, though by no means common, will retard the operation considerably, protracting the period of helplessness. This is the harvest season of the white fisherman and of the poor slave. The laziest of the former are now in full activity, wading along the shore from morning till night, dragging a small boat after them, and holding in the other hand a forked stick with which they raise the crabs from the sand. The period during which the crabs remain in the paper state is so short that great activity is required to gather a sufficient number to take to market; but the price at which they are sold is sufficient to awaken all the cupidity of the crabbers. Two dollars a dozen is by no means an uncommon price for them when the season first comes on; they subsequently come down to a dollar, and even to fifty cents; at any of which rates the trouble of collecting them is well paid. The slaves search for them at night, and then are obliged to kindle a fire of pine-knots on the bow of the boat, which strongly illuminates the surrounding water, and enables them to discover the crabs. Soft crabs are, with great propriety, regarded as an exquisite treat by those who are fond of such eating; and though many persons are unable to use crabs or lobsters in any form, there are few who taste of the soft crabs without being willing to recur to them. As an article of luxury, they are scarcely known north of the Chesapeake,

though there is nothing to prevent them from being used to considerable extent in Philadelphia, especially since the opening of the Chesapeake and Delaware canal. The summer of 1829, I had the finest soft crabs from Baltimore. They arrived at the market in the afternoon, were fried according to rule, and placed in a tin butter kettle, then covered for an inch or two with melted lard, and put on board the steamboat which left Baltimore at five o'clock the same afternoon. The next morning before ten o'clock they were in Philadelphia, and at one they were served up at dinner in Germantown. The only difficulty in the way is that of having persons to attend to their procuring and transmission; as, when cooked directly after they arrive at market, and forwarded with as little delay as above mentioned, there is no danger of their being the least injured.

At other seasons, when the crabs did not come close to the shore, I derived much amusement by taking them in the deep water. This is always easily effected by the aid of proper bait; a leg of chicken, piece of any raw meat, or a salted or spoiled herring, tied to a twine string of sufficient length, and a hand net of convenient size, is all that is necessary. You throw out your line and bait, or you fix as many lines to your boat as you please, and in a short time you see, by the straightening of the line, that the bait has been seized by a crab, who is trying to make off with it. You then place your net where it can conveniently be picked up, and commence steadily but gently to draw in your line, until you have brought the crab sufficiently near the surface to distinguish him; if you draw him nearer, he will see you and immediately let go; otherwise, his greediness and voracity will make him cling to his prey to the last. Holding the line in the left hand, you now dip your net edge foremost into the water at some distance from the line, carry it down perpendicularly until it is five or six inches lower than the crab, and then with a sudden turn out bring it directly before him, and lift up at the same time. Your prize is generally secured, if your net be at all properly placed; for as soon as he is alarmed, he pushes directly downwards, and is received in the bag of the net. It is better to have a little water in the bottom of the boat to throw them into, as they are easier emptied out of the net, always letting go when held over the water. This a good crabber never forgets; and should he unluckily be seized by a large crab, he holds him over the water and is freed at once, though he loses his game. When not held over the water, they bite sometimes with dreadful obstinacy; and I

have seen it necessary to crush the forceps or claws before one could be induced to let go the fingers of a boy. A poor black fellow also placed himself in an awkward situation; the crab seized him by a finger of his right hand, but he was unwilling to lose his captive by holding him over the water; instead of which he attempted to secure the other claw with his left hand, while he tried to crush the biting claw between his teeth. In doing this, he somehow relaxed his left hand, and with the other claw the crab seized poor Jem by his under lip,—which was by no means a thin one,—and caused him to roar with pain. With some difficulty he was freed from his tormentor; but it was several days before he ceased to excite laughter, as the severe bite was followed by a swelling of the lip, which imparted a most ludicrous expression to a naturally comical countenance.

No. VII.

ON the first arrival of the crabs, when they throng the shoals of the creeks in vast crowds, as heretofore mentioned, a very summary way of taking them is resorted to by the country people, and for a purpose that few would suspect without having witnessed it. They use a three pronged fork or gig, made for this sport, attached to a long handle; the crabber, standing up in the skiff, pushes it along until he is over a large collection of crabs, and then strikes his spear among them. By this several are transfixd at once, and lifted into the boat, and the operation is repeated until enough have been taken. The purpose to which they are to be applied is to feed the hogs, which very soon learn to collect in waiting upon the beach when the crab spearing is going on. Although these bristly gentry appear to devour almost all sorts of food with great relish, it seemed to me that they regarded the crabs as a most luxurious banquet; and it was truly amusing to see the grunterns, when the crabs were thrown on shore for them, and were scampering off in various directions, seizing them in spite of their threatening claws, holding them down with one foot, and speedily reducing them to a state of helplessness by breaking off their forceps. Such a crunching and cracking of the unfortunate crabs I never have witnessed since; and I might have commiserated them more, had not I known that death in some form or other was continually awaiting them, and that their

devourers were all destined to meet their fate in a few months in the sty, and thence through the smoke house to be placed upon our table. On the shores of the Chesapeake, I have caught crabs in a way commonly employed by all those who are unprovided with boats and nets. This is to have a forked stick and a baited line, with which the crabber wades out as far as he thinks fit, and then throws out his line. As soon as he finds he has a bite, he draws the line in, cautiously lifting but a very little from the bottom. As soon as it is near enough to be fairly in reach, he quickly, yet with as little movement as possible, secures the crab by placing the forked stick across his body, and pressing him against the sand. He must then stoop down and take hold of the crab by the two posterior swimming legs, so as to avoid being seized by the claws. Should he not wish to carry each crab ashore as he catches it, he pinions or *spansels* (as the fishermen call it) them. This is a very effectual mode of disabling them from using their biting claws; yet it is certainly not the most humane operation: it is done by taking the first of the sharp-pointed feet of each side, and forcing it in for the length of the joint behind the moveable joint or thumb of the opposite biting claw. The crabs are then strung upon a string or withe, and allowed to hang in the water until the crabber desists from his occupations. In the previous article, crabs were spoken of as curious and interesting, and the reader may not consider the particulars thus far given as being particularly so. Perhaps, when he takes them altogether, he will agree that they have as much that is curious about their construction as almost any animal we have mentioned; and in the interesting details we have as yet made but a single step.

The circumstance of the external skeleton has been mentioned, but who would expect an animal, as low in the scale as a crab, to be furnished with ten or twelve pair of jaws to its mouth? Yet such is the fact; and all these variously constructed pieces are provided with appropriate muscles, and move in a manner which can scarcely be explained, though it may be very readily comprehended when once observed in living nature. But, after all the complexity of the jaws, where would an inexperienced person look for their teeth? Surely not in the stomach. Nevertheless, such is their situation; and these are not mere appendages, that are called teeth by courtesy, but stout, regular grinding teeth, with a light brown surface. They are not only within the stomach, but fixed to a cartilage nearest to its lower extremity, so that the food, unlike that

of other creatures, is submitted to the action of the teeth as it is passing *from* the stomach; instead of being chewed before it is swallowed. In some species the teeth are five in number; but throughout this class of animals the same general principle of construction may be observed. Crabs and their kindred have no brain, because they are not required to reason upon what they observe; they have a nervous system excellently suited to their mode of life, and its knots or ganglia send out nerves to the organs of sense, digestion, motion, &c. The senses of these beings are very acute, especially their sight, hearing, and smell. Most of my readers have heard of crabs' eyes, or have seen these organs in the animal on the end of two little projecting knobs, above and on each side of the mouth; few of them, however, have seen the crab's ear, yet it is very easily found, and is a little triangular bump placed near the base of the feelers. This bump has a membrane stretched over it, and communicates with a small cavity, which is the internal ear. The *organ* of smell is not so easily demonstrated as that of hearing, though the evidence of their possessing the sense to an acute degree is readily attainable. A German naturalist inferred, from the fact of the nerve corresponding to the olfactory nerve in man being distributed to the antennæ, in insects, that the antennæ were the organs of smell in them. Cuvier and others suggest that a similar arrangement may exist in the crustacea. To satisfy myself whether it was so or not, I lately dissected a small lobster, and was delighted to find that the first pair of nerves actually went to the antennæ, and gave positive support to the opinion mentioned. I state this, not to claim credit for ascertaining the truth or inaccuracies of a suggestion, but with a view of inviting the reader to do the same in all cases of doubt. Where it is possible to refer to *nature* for the actual condition of facts, learned *authorities* give me no uneasiness. If I find that the structure bears out their opinions, it is more satisfactory; when it convicts them of absurdity, it saves much fruitless reading, as well as the trouble of shaking off prejudices.

The first time my attention was called to the extreme acuteness of sight possessed by these animals was during a walk along the flats of Long Island, reaching towards Governor's Island, in New York. A vast number of the small land crabs, called fiddlers by the boys, (*gecarcinus*), occupy burrows or caves dug in the marshy soil, whence they come out and go for some distance, either in search of food or to sun themselves. Long before I approached close enough to

see their forms with distinctness, they were scampering towards their holes, into which they plunged with a tolerable certainty of escape; these retreats being of considerable depth, and often communicating with each other, as well as nearly filled with water. On endeavouring cautiously to approach some others, it was quite amusing to observe their vigilance; to see them slowly change position, and from lying extended in the sun, beginning to gather themselves up for a start, should it prove necessary; at length, standing up as it were on tiptoe, and raising their pedunculated eyes as high as possible. One quick step on the part of the individual approaching was enough; away they would go, with a celerity which must appear surprising to any one who had not previously witnessed it. What is more remarkable, they possess the power of moving equally well with any part of the body foremost; so that, when endeavouring to escape, they will suddenly dart off from one side or the other, without turning round, and thus elude pursuit. My observations upon the crustaceous animals have extended through many years, and in very various situations; and for the sake of making the general view of their qualities more satisfactory, I will go on to state what I remarked of some of the genera and species in the West Indies, where they are exceedingly numerous and various. The greater proportion of the genera feed on animal matter, especially after decomposition has begun; a large number are exclusively confined to the deep waters, and approach the shoals and lands only during the spawning season. Many live in the sea, but daily pass many hours upon the rocky shores for the pleasure of basking in the sun; others live in marshy or moist ground, at a considerable distance from the water, and feed principally on vegetable food, especially the sugar cane, of which they are extremely destructive. Others again reside habitually on the hills or mountains, and visit the sea only once a year for the purpose of depositing their eggs in the sand. All those which reside in burrows made in moist ground, and those coming daily on the rocks to bask in the sun, participate in about an equal degree in the qualities of vigilance and swiftness. Many a breathless race have I run in vain, attempting to intercept them, and prevent their escaping into the sea. Many an hour of cautious and solicitous endeavour to steal upon them unobserved, has been frustrated by their long-sighted watchfulness; and several times, when, by extreme care and cunning approaches, I have actually succeeded in getting between a fine specimen and the sea, and had full hope of driving him farther inland,

have all my anticipations been ruined by the wonderful swiftness of their flight, or the surprising facility with which they would dart off in the very opposite direction, at the very moment I felt almost sure of my prize. One day, in particular, I saw on a flat rock, which afforded a fine sunning place, the most beautiful crab I had ever beheld. It was of the largest size, and would have covered a large dinner plate, most beautifully coloured with bright crimson below, and a variety of tints of blue, purple, and green above; it was just such a specimen as could not fail to excite all the solicitude of a collector to obtain. But it was not in the least deficient in the art of self-preservation; my most careful manœuvres proved ineffectual, and all my efforts only enabled me to see enough of it to augment my regrets to a high degree. Subsequently, I saw a similar individual in the collection of a resident; this had been killed against the rocks during a violent hurricane, with very slight injury to its shell. I offered high rewards to the black people if they would bring me such a one; but the most expert among them seemed to think it an unpromising search, as they knew of no way of capturing them. If I had been supplied with some powder of *nux vomica*, with which to poison some meat, I *might* have succeeded.

No. VIII

THE fleet running crab, (*cypoda pugilator*,) mentioned as living in burrows dug in a moist soil, and preying chiefly on the sugar cane, is justly regarded as one of the most noxious pests that can infest a plantation. Their burrows extend to a great depth, and run in various directions; they are also, like those of our fiddlers, nearly full of muddy water; so that, when these marauders once plump into their dens, they may be considered as entirely beyond pursuit. Their numbers are so great, and they multiply in such numbers, as in some seasons to destroy a large proportion of a sugar crop; and sometimes their ravages, combined with those of the rats and other plunderers, are absolutely ruinous to the sea-side planters. I was shown, by the superintendent of a place thus infested, a great quantity of cane utterly killed by these creatures, which cut it off in a peculiar manner, in order to suck the juice; and he assured me that, during that season, the crop would be two thirds less than

its average, solely owing to the inroads of the crabs, and rats, which, if possible, are still more numerous. It was to me an irresistible source of amusement to observe the air of spite and vexation with which he spoke of the crabs; the rats he could shoot, poison, or drive off for a time with dogs. But the crabs would not eat his poison while sugar cane was growing; the dogs could only chase them into their holes; and if, in helpless irritation, he sometimes fired his gun at a cluster of them, the shot only rattled over their shells like hail against a window. It is truly desirable that some summary mode of lessening their number could be devised; and it is probable that this will be best effected by poison, as it may be possible to obtain a bait sufficiently attractive to ensnare them. Species of this genus are found in various parts of our country, more especially towards the south. About Cape May, our friends may have excellent opportunities of testing the truth of what is said of their swiftness and vigilance.

The land crab, which is common to many of the West India islands, is more generally known as the Jamaica crab, because it has been most frequently described from observation in that island. Wherever found, they all have the habit of living, during great part of the year, in the highlands, where they pass the daytime concealed in huts, cavities, and under stones, and come out at night for their food. They are remarkable for collecting in vast bodies, and marching annually to the sea-side, in order to deposit their eggs in the sand; and this accomplished, they return to their former abodes, if undisturbed. They commence their march in the night, and move in the most direct line towards the destined point. So obstinately do they pursue this route, that they will not turn out of it for any obstacle that can possibly be surmounted. During the daytime they skulk, and lie hid as closely as possible; but thousands upon thousands of them are taken for the use of the table by whites and blacks, as on their seaward march they are very fat and of fine flavour. On the homeward journey, those that have escaped capture are weak, exhausted, and unfit for use. Before dismissing the crabs, I must mention one which was a source of much annoyance to me at first, and of considerable interest afterwards, from the observation of its habits. At that time I resided in a house delightfully situated about two hundred yards from the sea, fronting the setting sun, having in clear weather the lofty mountains of Porto Rico, distant about eighty miles, in view. Like most of the houses in the island, ours had seen better days, as was evident from

various breaks in the floors, angles rotted off the doors, sunken sills, and other indications of decay. Our sleeping room, which was on the lower floor, was especially in this condition; but as the weather was delightfully warm, a few cracks and openings, though rather large, did not threaten much inconvenience. Our bed was provided with that indispensable accompaniment, a musquito bar or curtain, to which we were indebted for escape from various annoyances. Scarcely had we extinguished the light, and composed ourselves to rest, than we heard, in various parts of the room, the most startling noises. It appeared as if numerous hard and heavy bodies were trailed along the floor; then they sounded as if climbing up by the chairs and other furniture, and frequently something like a large stone would tumble down from such elevations with a loud noise, followed by a peculiar chirping note. What an effect this produced upon entirely inexperienced strangers may well be imagined by those who have been suddenly waked up in the dark, by some unaccountable noise in the room. Finally, these invaders began to ascend the bed; but happily the musquito bar was securely tucked under the bed all around, and they were denied access, though their efforts and tumbles to the floor produced no very comfortable reflections. Towards daylight they began to retire, and in the morning no trace of any such visitants could be perceived. On mentioning our troubles, we were told that this nocturnal disturber was only Bernard the Hermit, called generally the soldier crab, perhaps from the peculiar habit he has of protecting his body by thrusting it into an empty shell, which he afterwards carries about until he outgrows it, when it is relinquished for a larger. Not choosing to pass another night quite so noisily, due care was taken to exclude Monsieur Bernard, whose knockings were thenceforward confined to the outside of the house. I baited a large wire rat trap with some corn meal, and placed it outside of the back door, and in the morning found it literally half filled with these crabs, from the largest sized shell that could enter the trap down to such as were not larger than a hickory nut. Here was a fine collection made at once, affording a very considerable variety in the size and age of the specimens, and the different shells into which they had introduced themselves.

The soldier or hermit crab, when withdrawn from his adopted shell, presents about the head and claws a considerable family resemblance to the lobster. The claws, however, are very short and broad, and the body covered with hard shell only in that part which is liable to be exposed or pro-

truded. The posterior or abdominal part of the body is covered only by a tough skin, and tapers towards a small extremity, furnished with a sort of hook-like apparatus, enabling it to hold on to its factitious dwelling. Along the surface of its abdomen, as well as on the back, there are small projections, apparently intended for the same purpose. When once fairly in possession of a shell, it would be quite a difficult matter to pull the crab out, though a very little heat applied to the shell will quickly induce him to leave it. The shells they select are taken solely with reference to their suitableness, and hence you may catch a considerable number of the same species, each of which is in a different species or genus of shell. The shells commonly used by them, when of larger size, are those of the whilk, which are much used as an article of food by the islanders, or the smaller conch [*strombus*] shells. The very young hermit crabs are seen in almost every variety of small shell found on the shores of the Antilles. I have frequently been amused by seeing ladies eagerly engaged in making a collection of these beautiful little shells, and not dreaming of their being tenanted by a living animal, suddenly startled, on displaying their acquisitions, at observing them to be actively endeavouring to escape; or on introducing the hand into the reticule to produce a particular fine specimen, to receive a smart pinch from the claws of the little hermit. The instant the shell is closely approached or touched, they withdraw as deeply into it as possible, and the small ones readily escape observation; but they soon become impatient of captivity, and try to make off. The species of this genus (*pagurus*) are very numerous, and during the first part of their lives are all aquatic; that is, they are hatched in the little pools about the margin of the sea, and remain there until those that are destined to live on land are stout enough to commence their travels. The hermit crabs, which are altogether aquatic, are by no means so careful to choose the lightest and thinnest shells, as the land troops. The aquatic soldiers may be seen towing along shells of most disproportionate size; but their relatives, who travel over the hills by moonlight, know that all unnecessary encumbrance of weight should be avoided. They are as pugnacious and spiteful as any of the crustaceous class; and when taken, or when they fall and jar themselves considerably, utter a chirping noise, which is evidently an angry expression. They are ever ready to bite with their claws, and the pinch of the larger individuals is quite painful. It is said, that when they are changing their shells, for the sake of obtaining more commo-

dious coverings, they frequently fight for possession, which may be true where two that have forsaken their old shells meet, or happen to make choice of the same vacant one. It is also said, that one crab is sometimes forced to give up the shell he is in, should a stronger chance to desire it. This, as I never saw it, I must continue to doubt; for I cannot imagine how the stronger could possibly accomplish his purpose, seeing that the occupant has nothing to do but keep close quarters. The invader would have no chance of seizing him to pull him out, nor could he do him any injury by biting upon the surface of his hard claws, the only part that would be exposed. If it be true that one can dispossess the other, it must be by some contrivance of which we are still ignorant. These soldier crabs feed on a great variety of substances, scarcely refusing any thing that is edible; like the family they belong to, they have a decided partiality for putrid meats, and the planters accuse them also of too great a fondness for the sugar cane. Their excursions are altogether nocturnal; in the daytime they lie concealed very effectually in small holes, among stones, or any kind of rubbish, and are rarely taken notice of, even where hundreds are within a short distance of each other. The larger soldier crabs are sometimes eaten by the blacks; but they are not much sought after, even by them, as they are generally regarded with aversion and prejudice. There is no reason, that we are aware of, why they should not be as good as many other crabs, but they certainly are not equally esteemed.

No. IX.

THOSE who have only lived in forest countries, where vast tracts are shaded by a dense growth of oak, ash, chestnut, hickory, and other trees of deciduous foliage, which present the most pleasing varieties of verdure and freshness, can have but little idea of the effect produced on the feelings by aged forests of pine, composed in great degree of a single species, whose towering summits are crowded with one dark green canopy, which successive seasons find unchanged, and nothing but death causes to vary. Their robust and gigantic trunks rise a hundred or more feet high, in purely proportioned columns, before the limbs begin to diverge; and their tops, densely clothed with long bristling foliage, intermingle

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ly as to allow of but slight entrance to the sun. The undergrowth of such forests is comparatively thin, since none but shrubs and plants that love shade can flourish under this perpetual exclusion of the bright and invigorating rays of the great exciter of the world. Through such forests and by the merest path in great part, it was my lot to pass many miles every day; and had I not endeavoured to derive amusement and instruction from the study of the forest, my time would have been as fatiguing to me as it was quiet and solemn. But wherever nature is, and whatever form she may present herself, enough is offered to fix attention and produce pleasure, if we descend to observe with carefulness. I soon found that a pine forest was far from being devoid of interest, and I endeavour to prove this by stating the result of observations made during the time I lived in this

common pitch, or as it is generally called Norway spruce, grows from a seed which is matured in vast abundance in the large cones peculiar to the pines. This seed is of a triangular shape, thick and heavy at the part by which it is attached to the cone, and terminating in a broad mem-

retreat, that served me as a private study, or closet, though enjoying all the advantages of the open air. A road that had once passed through the field, and was of course more compacted than any other part, had denied access to the pine seeds for a certain distance, while on each side of it they grew with their usual density. The ground was covered with the soft layer or carpet of dried pine leaves, which gradually and imperceptibly fall throughout the year, making a most pleasant surface to tread on, and rendering the step perfectly noiseless. By beating off with a stick all the dried branches that projected towards the vacant space, I formed a sort of chamber, fifteen or twenty feet long, which above was canopied by the densely mingled branches of the adjacent trees, which altogether excluded or scattered the rays of the sun, and on all sides was so shut in by the trunks of the young trees as to prevent all observation. Hither, during the hot season, I was accustomed to retire, for the purpose of reading or meditation; and within this deeper solitude, where all was solitary, very many of the subsequent movements of my life were suggested or devised.

From all I could observe, and all the inquiries I could get answered, it appeared that this rapidly growing tree does not attain its full growth until it is eighty or ninety years old, nor does its time of full health and vigour much exceed a hundred. Before this time it is liable to the attacks of insects, but these are of a kind that bore the tender spring shoots to deposit their eggs therein, and their larvæ appear to live principally on the sap, which is very abundant, so that the tree is but slightly injured. But after the pine has attained its acme, it is attacked by an insect which deposits its egg in the body of the tree, and the larva devours its way through the solid substance of the timber; so that, after a pine has been for one or two seasons subjected to these depredators, it will be fairly riddled, and if cut down is unfit for any other purpose than burning. Indeed, if delayed too long, it is poorly fit for firewood, so thoroughly do these insects destroy its substance. At the same time that one set of insects is engaged in destroying the body, myriads of others are at work under the bark, destroying the sap vessels, and the foliage wears a more and more pale and sickly appearance as the tree declines in vigour. If not cut down, it eventually dies, becomes leafless, stripped of its bark, and, as the decay advances, all the smaller branches are broken off, and it stands with its naked trunk and a few ragged limbs, as if bidding defiance to the tempest which howls around its head. Under favourable circumstances, a

large trunk will stand in this condition for nearly a century, so extensive and powerful are its roots, so firm and stubborn the original knitting of its giant frame. At length some storm, more furious than all its predecessors, wrenches those ponderous roots from the soil, and hurls the helpless carcass to the earth, crushing all before it in its fall. Without the aid of fire, or some peculiarity of situation favourable to rapid decomposition, full another hundred years will be requisite to reduce it to its element, and obliterate the traces of its existence. Indeed, long after the lapse of more than that period, we find the heart of the pitch pine still preserving its original form, and from being thoroughly imbued with turpentine, become utterly indestructible except by fire.

If the proprietor attend to the warnings afforded by the woodpecker, he may always cut his pines in time to prevent them from being injured by insects. The woodpeckers run up and around the trunks, tapping from time to time with their powerful bills. The bird knows at once by the sound whether there be insects below or not. If the tree is sound the woodpecker soon forsakes it for another; should he begin to break into the bark, it is to catch the worm, and such trees are at once to be marked for the axe. In felling such pines, I found the woodmen always anxious to avoid letting them strike against neighbouring sound trees, as they said that the insects more readily attacked an injured tree than one whose bark was unbroken. The observation is most probably correct; at least the experience of country folks in such matters is rarely wrong, though they sometimes give very odd reasons for the processes they adopt.

A full grown pine forest is at all times a grand and majestic object to one accustomed to moving through it. Those vast and towering columns, sustaining a waving crown of deepest verdure; those robust and rugged limbs standing forth at a vast height overhead, loaded with the cones of various seasons; and the diminutiveness of all surrounding objects compared with these gigantic children of nature, cannot but inspire ideas of seriousness and even of melancholy. But how awful and even tremendous does such a situation become, when we hear the first wailings of the gathering storm, as it stoops upon the lofty summits of the pine, and soon increases to a deep hoarse roaring, as the boughs begin to wave in the blast, and the whole tree is forced to sway before its power!

In a short time the fury of the wind is at its height, the loftiest trees bend suddenly before it, and scarce regain their

upright position ere they are again obliged to cower beneath its violence. Then the tempest literally howls, and amid the tremendous reverberations of thunder, and the blazing glare of the lightning, the unfortunate wanderer hears around him the crash of numerous trees hurled down by the storm, and knows not but the next may be precipitated upon him. More than once have I witnessed all the grandeur, dread, and desolation of such a scene, and have always found safety either by seeking as quickly as possible a spot where there were none but young trees, or if on the main road choosing the most open and exposed situation, out of the reach of the large trees. There, seated on my horse, who seemed to understand the propriety of such patience, I would quietly remain, however thoroughly drenched, until the fury of the wind was completely over. To say nothing of the danger from falling trees, the peril of being struck by the lightning, which so frequently shivers the loftiest of them, is so great as to render any attempt to advance, at such time, highly imprudent.

Like the ox among animals, the pine tree may be looked upon as one of the most universally useful of the sons of the forest. For all sorts of building, for firewood, tar, turpentine, rosin, lampblack, and a vast variety of other useful products, this tree is invaluable to man. Nor is it a pleasing contemplation, to one who knows its usefulness, to observe to how vast an amount it is annually destroyed in this country, beyond the proportion that nature can possibly supply. However, we are not disposed to believe that this evil will ever be productive of very great injury, especially as coal fuel is becoming annually more extensively used. Nevertheless, were I the owner of a pine forest, I should exercise a considerable degree of care in the selection of the wood for the axe.

No. X.

AMONG the enemies with which the farmers of a poor or light soil have to contend, I know of none so truly formidable and injurious as the crows, whose numbers, cunning, and audacity can scarcely be appreciated, except by those who have had long continued and numerous opportunities of observation. Possessed of the most acute sense, and endowed by nature with a considerable share of reasoning power, these

birds bid defiance to almost all the contrivances resorted to for their destruction; and when their numbers have accumulated to vast multitudes, which annually occurs, it is scarcely possible to estimate the destruction they are capable of effecting. Placed in a situation where every object was subjected to close observation, as a source of amusement, it is not surprising that my attention should be drawn to so conspicuous an object as the crow; and having once commenced remarking the peculiarities of this bird, I continued to bestow attention upon it during many years, in whatever situation it was met with. The thickly wooded and well watered parts of the state of Maryland, as affording them a great abundance of food, and almost entire security during their breeding season, are especially infested by these troublesome creatures; so that at some times of the year they are collected in numbers which would appear incredible to any one unaccustomed to witness their accumulations.

Individually, the common crow (*corvus corona*) may be compared in character with the brown or Norway rat, being, like that quadruped, addicted to all sorts of mischief, destroying the lives of any small creatures that may fall in its way, plundering with audacity wherever any thing is exposed to its rapaciousness, and triumphing, by its cunning, over the usual artifices employed for the destruction of ordinary noxious animals. Where food is at any time scarce, or the opportunity for such marauding inviting, there is scarcely a young animal about the farmyards safe from the attacks of the crow. Young chickens, ducks, goslings, and even little pigs, when quite young and feeble, are carried off by them. They are not less eager to discover the nests of domestic fowls, and will sit very quietly in sight, at a convenient distance, until the hen leaves the nest, and then fly down and suck her eggs at leisure. But none of their tricks excited in me a greater interest than the observation of their attempts to rob a hen of her chicks. The crow, alighting at a little distance from the hen, would advance in an apparently careless way towards the brood, when the vigilant parent would bristle up her feathers, and rush at the black rogue to drive him off. After several such approaches, the hen would become very angry, and would chase the crow to a greater distance from the brood. This is the very object the robber has in view; for as long as the parent keeps near her young, the crow has very slight chance of success; but as soon as he can induce her to follow him to a little distance from the brood, he takes advantage of his wings, and before she can regain her

place, has flown over her, and seized one of her chickens. When the cock is present, there is still less danger from such an attack; for chanticleer shows all his vigilance and gallantry in protecting his tender offspring, though it frequently happens that the number of hens with broods renders it impossible for him to extend his care to all. When the crow tries to carry off a gosling from the mother, it requires more daring and skill, and is far less frequently successful, than in the former instance. If the gander be in company, which he almost uniformly is, the crow has his labour in vain. Notwithstanding the advantages of flight and superior cunning, the honest vigilance and determined bravery of the former are too much for him. His attempts to approach, however cautiously conducted, are promptly met, and all his tricks rendered unavailing, by the fierce movements of the gander, whose powerful blows the crow seems to be well aware might effectually disable him. The first time I witnessed such a scene, I was at the side of a creek, and saw on the opposite shore a goose with her goslings beset by a crow: from the apparent alarm of the mother and brood, it seemed to me they must be in great danger, and I called to the owner of the place, who happened to be in sight, to inform him of their situation. Instead of going to their relief, he shouted back to me, to ask if the gander was not there too; and as soon as he was answered in the affirmative, he bid me be under no uneasiness, as the crow would find his match. Nothing could exceed the cool impudence and pertinacity of the crow, who, perfectly regardless of my shouting, continued to worry the poor gander for an hour, by his efforts to obtain a nice gosling for his next meal. At length, convinced of the fruitlessness of his efforts, he flew off to seek some more easily procurable food. Several crows sometimes unite to plunder the goose of her young, and are then generally successful, because they are able to distract the attention of the parents, and lure them farther from their young.

In the summer the crows disperse in pairs for the purpose of raising their young, and then they select lofty trees in the remotest parts of the forest, upon which, with dry sticks and twigs, they build a large strong nest, and line it with softer materials. They lay four or five eggs, and when they are hatched, feed, attend, and watch over their young with the most zealous devotion. Should any one by chance pass near the nest while the eggs are still unhatched, or the brood are very young, the parents keep close, and neither by the slightest movement nor noise betray their presence.

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the young are fledged, and beginning to take their first flight, the approach of a man, especially if armed with a gun, calls forth all their cunning and solicitude. They are immediately placed in the securest place at hand, where the foliage is thickest, and remain perfectly motionless. Not so the alarmed parents, both of which fly round and nearer to the hunter, uttering the most discordant notes, with an occasional peculiar note, which seems intended to direct or warn their young. So close do they come, and so clamorous are they as the hunter endeavours to get a good view of them on the tree, that he is uniformly persuaded the young crows are also concealed there; but he does not perceive, as he is cautiously moving to get within gunshot, that they are moving from tree to tree, and at each remove are farther and farther from the place where the young are hid. After continuing this trick for some time, it is impossible that the hunter can retain any idea of the position of the young ones, the parents cease their dissonant outcries, fly quietly to the most convenient lofty perch, and calmly watch the movements of their disturber. When they then utter a loud quick cry, which seems intended to bid their offspring lie close and keep quiet; it is very generally the case that they escape all danger.

this way, they place one or more sentinels, according to circumstances, in convenient places; and these are exceedingly vigilant, uttering a single warning call, which puts the whole to flight the instant there is the least appearance of danger or interruption. Having fixed their sentinels, they begin regularly at one part of the field, and pursuing the rows along, pulling up each shoot in succession, and biting off the corn at the root. The green shoots thus left along the rows, if they had been arranged with care, offer a melancholy memorial of the work which has been effected by these cunning and destructive plunderers.

Numerous experiments have been made, where the crows are thus injurious, to avert their ravages; and the method I shall now relate I have seen tried with the most gratifying success. In a large tub a portion of tar and grease were mixed, so as to render the tar sufficiently thin and soft, and to this was added a portion of slacked lime in powder, and the whole stirred until thoroughly incorporated. The seed-corn was then thrown in, and stirred with the mixture until each grain received a uniform coating. The corn was then dropped in the hills, and covered as usual. This treatment was found to retard the germination about three days, as the mixture greatly excludes moisture from the grain. But the crows did no injury to the field; they pulled up a small quantity in different parts of the planting to satisfy themselves it was all alike; upon becoming convinced of which, they quietly left it for some less carefully managed grounds, where pains had not been taken to make all the corn so nauseous and bitter.

No. XI.

It rarely happens that any of the works of nature are wholly productive of evil; and even the crows, troublesome as they are, contribute in a small degree to the good of the district they frequent. Thus, though they destroy eggs and young poultry, plunder the corn-fields, and carry off whatever may serve for food, they also rid the surface of the earth of a considerable quantity of carrion and a vast multitude of insects and their destructive larvæ. The crows are very usefully employed when they alight upon newly-ploughed fields, and pick up great numbers of those large and long-lived worms which are so destructive to the roots

of all growing vegetables; and they are scarcely less so when they follow the seine haulers along the shores, and pick up the small fishes, which would otherwise be left to putrefy and load the air with unpleasant vapours. Nevertheless, they become far more numerous in some parts of the country than is at all necessary to the good of the inhabitants, and whoever would devise a method of lessening their number suddenly, would certainly be doing a service to the community.

About a quarter of a mile above the house I lived in, on Curtis's creek, the shore was a sand bank, or bluff, twenty or thirty feet high, crowned with a dense young pine forest to its very edge. Almost directly opposite, the shore was flat, and formed a point extending in the form of a broad sand bar, for a considerable distance into the water; and, when the tide was low, this flat afforded a fine level space, to which nothing could approach, in either direction, without being easily seen. At a short distance from the water, a young swamp wood of maple, gum, oaks, &c., extended back, towards some higher ground. As the sun descended, and threw his last rays in one broad sheet of golden effulgence over the crystal mirror of the waters, innumerable companies of crows arrived daily, and settled on this point, for the purpose of drinking, picking up gravel, and uniting in one body prior to retiring for the night to their accustomed dormitory. The trees adjacent, and all the shore, would be literally blackened by those plumed marauders, while their increasing outcries, chattering, and screams, were almost deafening. It certainly seems that they derive great pleasure from their social habits, and I often amused myself by thinking the uninterrupted clatter which was kept up, as the different gangs united with the main body, was produced by the recital of the adventures they had encountered during their last marauding excursions. As the sun became entirely sunk below the horizon, the grand flock crossed to the sand bluff on the opposite side, where they generally spent a few moments in picking up a further supply of gravel, and then, rising in dense and ample column, they sought their habitual roost in the deep entanglements of the distant pines. This daily visit to the point, so near to my dwelling, and so accessible by means of the skiff, led me to hope that I should have considerable success in destroying them. Full of such anticipations, I loaded two guns, and proceeded in my boat to the expected place of action, previous to the arrival of the crows. My view was to have my boat somewhere about halfway between the two shores, and as they never mani-

fested much fear of boats, to take my chance of firing upon the main body as they were flying over my head to the opposite side of the river. Shortly after I had gained my station, the companies began to arrive, and every thing went on as usual. But whether they suspected some mischief from seeing a boat so long stationary in their vicinity, or could see and distinguish the guns in the boat, I am unable to say; the fact was, however, that when they set out to fly over, they passed at an elevation which secured them from my artillery effectually, although, on ordinary occasions, they were in the habit of flying over me at a height of not more than twenty or thirty feet. I returned home without having had a shot, but resolved to try if I could not succeed better the next day. The same result followed the experiment; and when I fired at one gang, which it appeared possible to attain, the instant the gun was discharged, the crows made a sort of halt, descended considerably, flying in circles, and screaming most vociferously, as if in contempt or derision. Had I been prepared for this, a few of them might have suffered for their bravado. But my second gun was in the bow of the boat, and before I could get it, the black gentry had risen to their former security. While we were sitting at tea that evening, a black came to inform me that a considerable flock of crows, which had arrived too late to join the great flock, had pitched in the young pines, not a great way from the house, and at a short distance from the roadside. We quickly had the guns in readiness; and I scarcely could restrain my impatience until it should be late enough and dark enough to give us a chance of success. Without thinking of any thing but the great number of the crows, and their inability to fly to advantage in the night, my notions of the numbers we should bring home were extravagant enough, and I only regretted that we might be obliged to leave some behind. At length, led by the black boy, we sallied forth, and soon arrived in the vicinity of this temporary and unusual roost; and now the true character of the enterprise began to appear. We were to leave the road, and penetrate several hundred yards among the pines, whose proximity to each other, and the difficulty of moving between which, on account of the dead branches, has been heretofore stated. Next, we had to be careful not to alarm the crows before we were ready to act, and at the same time were to advance with cocked guns in our hands. The only way of moving forwards at all, I found to be that of turning my shoulders as much as possible to the dead branches, and breaking my way as gently as I could. At last we reached

the trees upon which the crows were roosting; but as the foliage of the young pines was extremely dense, and the birds were full forty feet above the ground, it was out of the question to distinguish where the greatest number were situated. Selecting the trees which appeared by the greater darkness of their summits to be most heavily laden with our game, my companion and I pulled our triggers at the same moment. The report was followed by considerable outcries from the crows, by a heavy shower of pine twigs and leaves upon which the shot had taken effect, and a deafening roar, caused by the sudden rising on the wing of the alarmed sleepers. One crow at length fell near me, which was wounded too badly to fly or retain his perch; and as the flock had gone entirely off, with this one crow did I return, rather crestfallen, from my grand nocturnal expedition. This crow, however, afforded me instructive employment and amusement during the next day, in the dissection of its nerves and organs of sense; and I know not that I ever derived more pleasure from any anatomical examination than I did from the dissection of its internal ear. The extent and convolutions of its semicircular canals show how highly the sense of hearing is perfected in these creatures; and those who wish to be convinced of the truth of what we have stated in relation to them may still see this identical crow skull in the Baltimore museum, to which I presented it after finishing the dissection. At least I saw it there a year or two since; though I little thought, when employed in examining, or even when I last saw it, that it would ever be the subject of such a reference "in a printed book."

Not easily disheartened by preceding failures, I next resolved to try to outwit the crows; and for this purpose prepared a long line, to which a very considerable number of lateral lines were tied, having each a very small fishing hook at the end. Each of these hooks was baited with a single grain of corn, so cunningly put on that it seemed impossible that the grain could be taken up without the hook being swallowed with it. About four o'clock, in order to be in full time, I rowed up to the sandy point, made fast my main line to a bush, and extending it toward the water, pegged it down at the other end securely in the sand. I next arranged all my baited lines, and then covering them all nicely with sand, left nothing exposed but the bait. This done, I scattered a quantity of corn all around, to render the baits as little liable to suspicion as possible. After taking a final view of the arrangement, which seemed a very hopeful one, I pulled my boat gently homeward, to

wait the event of my solicitude for the capture of the crows. As usual, they arrived in thousands, blackened the sand beach, chattered, screamed, and fluttered about in great glee, and finally sailed over the creek and away to their roost, without having left a solitary unfortunate to pay for having meddled with my baited hooks. I jumped into the skiff, and soon paid a visit to my unsuccessful snare. The corn was all gone; the very hooks were all bare, and it was evident that some other expedient must be adopted before I could hope to succeed. Had I caught but one or two *alive*, it was my intention to have employed them to procure the destruction of others, in a manner I shall hereafter describe.

No. XII.

HAD I succeeded in obtaining some living crows, they were to be employed in the following manner: After having made a sort of concealment of brushwood within good gunshot distance, the crows were to be fastened by their wings on their backs, between two pegs; yet not so closely as to prevent them from fluttering or struggling. The other crows, who are always very inquisitive where their species is in any trouble, were expected to settle down near the captives; and the latter would certainly seize the first that came near enough with their claws, and hold on pertinaciously. This would have produced fighting and screaming in abundance; and the whole flock might gradually be so drawn into the fray as to allow many opportunities of discharging the guns upon them with full effect. This I have often observed, that when a quarrel or fight took place in a large flock or gang of crows, a circumstance by no means infrequent, it seemed soon to extend to the whole, and, during the continuance of their anger, all the usual caution of their nature appeared to be forgotten, allowing themselves at such times to be approached closely, and regardless of men, firearms, or the fall of their companions, continuing their wrangling with rancorous obstinacy. A similar disposition may be produced among them by catching a large owl, and tying it with a cord of moderate length to the limb of a naked tree in a neighbourhood frequented by the crows. The owl is one of the few enemies which the crow has much reason to dread, as it robs the nests of their young, whenever they are left for the shortest time. Hence, whenever crows discover an owl in the daytime, like many other birds, they commence an attack upon it, screaming most vociferously, and

bringing together all of their species within hearing. Once this clamour has fairly begun, and their passions are fully aroused, there is little danger of their being scared away, and the chance of destroying them by shooting is continued as long as the owl remains uninjured. But one such opportunity presented during my residence where crows were abundant, and this was unfortunately spoiled by the eagerness of one of the gunners, who, in his anxiety to demolish one of the crows, fixed upon some that were most busy with the owl, and killed it instead of its disturbers, which at once ended the sport. When the crows leave the roost, at early dawn, they generally fly to a naked or leafless tree, in the nearest field, and there plume themselves and chatter until the daylight is sufficiently clear to show all objects with distinctness. Of this circumstance I have taken advantage several times to get good shots at them in this way. During the daytime, having selected a spot within proper distance of the tree frequented by them in the morning, I have built with brushwood and pine bushes a thick, close screen, behind which one or two persons might move securely without being observed. Proper openings, through which to level the guns, were also made, as the slightest stir or noise could not be made at the time of action, without a risk of rendering all the preparations fruitless. The guns were all in order and loaded before going to bed, and at an hour or two before daylight we repaired quietly to the field and stationed ourselves behind the screen, where, having mounted our guns at the loop-holes to be in perfect readiness, we waited patiently for the daybreak. Soon after the gray twilight of the dawn began to displace the darkness, the voice of one of our expected visitants would be heard from the distant forest, and shortly after a single crow would slowly sail towards the solitary tree, and settle on its very summit. Presently a few more would arrive singly, and in a little while small flocks followed. Conversation among them is at first rather limited to occasional salutations, but as the flock begins to grow numerous, it becomes general and very animated, and by this time all that may be expected on this occasion have arrived. This may be known also, by observing one or more of them descend to the ground, and if the gunners do not now make the best of the occasion, it will soon be lost, as the whole gang will presently sail off, scattering as they go. However, we rarely waited till there was a danger of their departure, but as soon as the flock had fairly arrived and were still crowded upon the upper parts of the tree, we pulled triggers together, aiming at the thickest

of the throng. In this way, by killing and wounding them, with two or three guns, a dozen or more would be destroyed. It was of course needless to expect to find a similar opportunity in the same place for a long time afterwards, as those which escaped had too good memories to return to so disastrous a spot. By ascertaining other situations at considerable distances, we could every now and then obtain similar advantages over them.

About the years 1800-4, the crows were so vastly accumulated and destructive in the state of Maryland, that the government, to hasten their diminution, received their heads in payment of taxes, at the price of three cents each. The store-keepers bought them of the boys and shooters, who had no taxes to pay, at a rather lower rate, or exchanged powder and shot for them. This measure caused a great havoc to be kept up among them, and in a few years so much diminished the grievance that the price was withdrawn. Two modes of shooting them in considerable numbers were followed, and with great success; the one, that of killing them while on the wing towards the roost, and the other attacking them in the night when they had been for some hours asleep. I have already mentioned the regularity with which vast flocks move from various quarters of the country to their roosting places every afternoon, and the uniformity of the route they pursue. In cold weather, when all the small bodies of water are frozen, and they are obliged to protract their flight towards the bays or sea, their return is a work of considerable labour, especially should a strong wind blow against them; at this season also, being rather poorly fed, they are of necessity less vigorous. Should the wind be adverse, they fly as near the earth as possible, and of this the shooters at the time I allude to took advantage. A large number would collect on such an afternoon, and station themselves close along the footway of a high bank, over which the crows were in the habit of flying; and as they were in a great degree screened from sight as the flock flew over, keeping as low as possible because of the wind, their shots were generally very effectual. The stronger was the wind, the greater was their success. The crows that were not injured found it very difficult to rise; and those that diverged laterally, only came nearer to gunners stationed in expectation of such movements. The flocks were several hours in passing over, and as there was generally a considerable interval between each company of considerable size, the last arrived, unsuspecting of what had been going on, and the shooters had time to recharge their arms. But the grand

harvest of crow heads was derived from the invasion of their dormitories, which are well worthy a particular description, and should be visited by every one who wishes to form a proper idea of the number of these birds that may be accumulated in a single district. The roost is most commonly the densest pine thicket that can be found, generally at no great distance from some river, bay, or other sheet of water, which is the last to freeze, or rarely is altogether frozen. To such a roost the crows, which are, during the daytime, scattered over perhaps more than a hundred miles of circumference, wing their way every afternoon, and arrive shortly after sunset. Endless columns pour in from various quarters, and as they arrive pitch upon their accustomed perches, crowding closely together for the benefit of the warmth and the shelter afforded by the thick foliage of the pine. The trees are literally bent by their weight, and the ground is covered for many feet in depth by their dung, which, by its gradual fermentation, must also tend to increase the warmth of the roost. Such roosts are known to be thus occupied for years, beyond the memory of individuals; and I know of one or two which the oldest residents in the quarter state to have been known to their grandfathers, and probably had been resorted to by the crows during several ages previous. There is one of great age and magnificent extent in the vicinity of Rock Creek, an arm of the Patapsco. They are sufficiently numerous on the rivers opening into the Chesapeake, and are everywhere similar in their general aspect. Wilson has signalized such a roost at no great distance from Bristol, Pa., and I know by observation, that not less than a million of crows sleep there nightly during the winter season.

To gather crow heads from the roost, a very large party was made up, proportioned to the extent of surface occupied by the dormitory. Armed with double barrelled and duck guns, which threw a large charge of shot, the company was divided into small parties, and these took stations, selected during the daytime, so as to surround the roost as nearly as possible. A dark night was always preferred, as the crows could not when alarmed fly far, and the attack was delayed until full midnight. All being at their posts, the firing was commenced by those who were most advantageously posted, and followed up successively by the others, as the affrighted crows sought refuge in their vicinity. On every side the carnage then raged fiercely, and there can scarcely be conceived a more forcible idea of the horrors of a battle, than such a scene afforded. The crows screaming with fright and the pain of wounds, the loud deep roar produced by the

raising of their whole number in the air, the incessant flashing and thundering of the guns, and the shouts of their eager destroyers, all produced an effect which can never be forgotten by any one who has witnessed it, nor can it well be adequately comprehended by those who have not. Blinded by the blaze of the powder, and bewildered by the thicker darkness that ensues, the crows rise and settle again at a short distance, without being able to withdraw from the field of danger; and the sanguinary work is continued until the shooters are fatigued, or the approach of daylight gives the survivors a chance of escape. Then the work of collecting the heads from the dead and wounded began, and this was a task of considerable difficulty, as the wounded used their utmost efforts to conceal and defend themselves. The bill and half the front of the skull were cut off together, and strung in sums for the tax-gatherer, and the product of the night divided according to the nature of the party formed. Sometimes the great mass of shooters were hired for the night, and received no shares of scalps, having their ammunition provided by the employers; other parties were formed of friends and neighbours, who clubbed for the ammunition, and shared equally in the result.

During hard winters the crows suffer severely, and perish in considerable numbers from hunger, though they endure a wonderful degree of abstinence without much injury. When starved severely, the poor wretches will swallow bits of leather, rope, rags, in short any thing that appears to promise the slightest relief. Multitudes belonging to the Bristol roost perished, during the winter of 1828-9, from this cause. All the water courses were solidly frozen, and it was distressing to observe these starvelings every morning winging their weary way towards the shores of the sea in hopes of food, and again to see them toiling homewards in the afternoon, apparently scarce able to fly.

In speaking of destroying crows, we have never adverted to the use of poison, which in their case is wholly inadmissible on this account. Where crows are common hogs generally run at large, and to poison the crows would equally poison them; the crows would die, and fall to the ground, where they would certainly be eaten by the hogs.

Crows, when caught young, learn to talk plainly, if pains be taken to repeat certain phrases to them, and they become exceedingly impudent and troublesome. Like all of their tribe, they will steal and hide silver or other bright objects, of which they can make no possible use.

THE END.

